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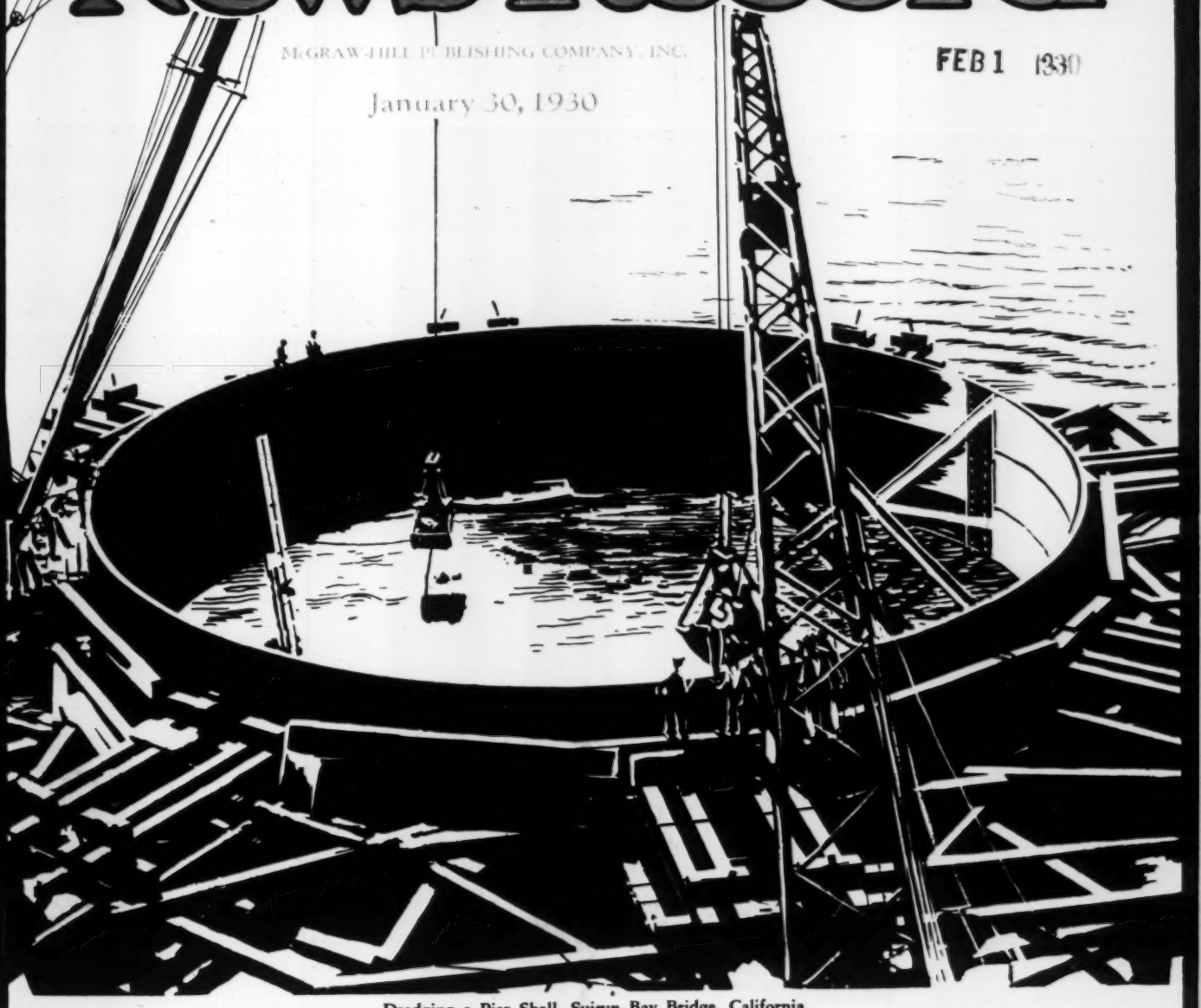


Dredging a Pier Shell, Suisun Bay Bridge, California

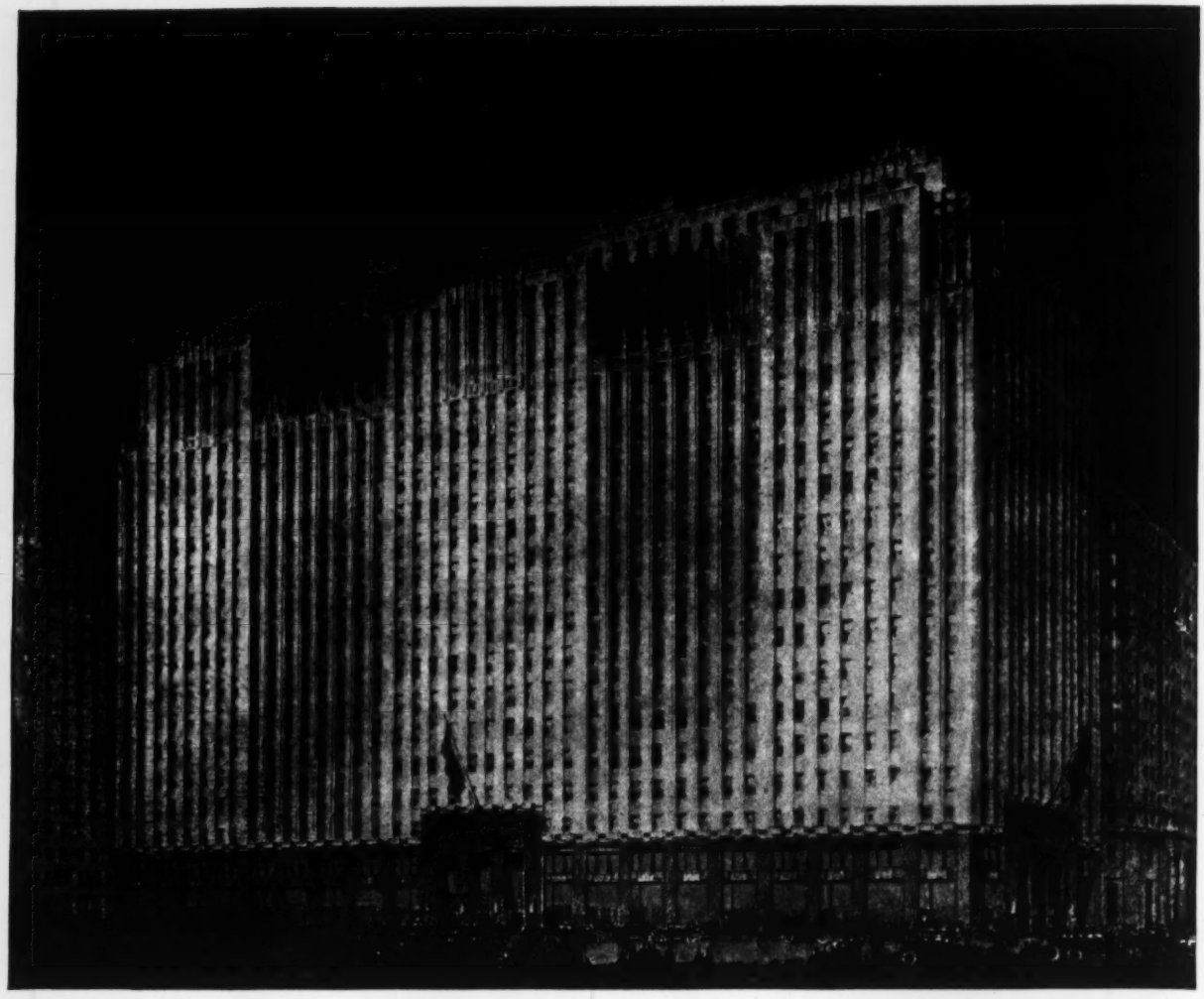
Pier Construction for Suisun Bay Bridge

Improvements Effect Economies on C&O Ry.

Steel Frames for Houses

Regional Planning for Los Angeles County

Depreciation of Railroad Property



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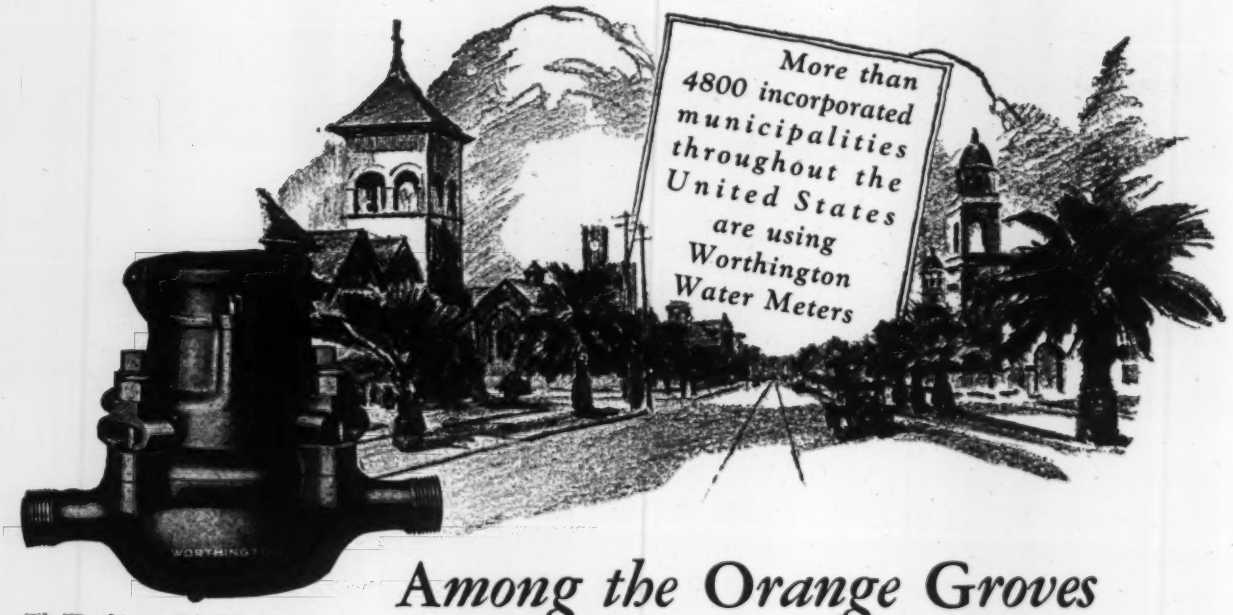

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ENGINEERING NEWS-RECORD

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 104 NEW YORK, JANUARY 30, 1930 Number 5

Unprecedented and Reprehensible

PRECEDENTS are being broken daily in the battle of rival contenders for municipal contracts. The latest and most reprehensible case at hand is an appeal to public clamor to decide who should be given the award for an important water conduit at San Diego, Calif., decision to go to the side bringing out the most and noisiest voices. As a means to that end resort was had to advertising spreads in the local press and later a packed city hall on the day set for the award. Each rival bidder appealed to prejudice rather than to reason. Each advertisement ignored the fact that the city had a water engineer whose advice should receive first consideration. Such use of local advertising is unprecedented. It is against efficient municipal government and damaging to manufacturers and contractors.

Safeguard Air Travel!

THE tragic fate of sixteen persons who crashed in an air liner en route from Agua Caliente to Los Angeles on Jan. 19 has shocked the entire country. Such disasters, however deplorable from the loss-of-life viewpoint, may lead to progress by directing attention to improvement of equipment or methods. If the committees investigating the Jan. 19 crash confirm first reports that the landing flares had not been released and that, judged by the condition of the propellers, the throttles had not been closed as would have been the case were the pilot trying to land, then there is little doubt that low visibility attendant upon rain and fog was the primary cause. Radio communication with planes in flight, which has reached a practicable stage, can be used to give the pilot frequent information as to the ceiling height, and with such aids there should be no occasion for incurring the danger of low-level flying in a vain endeavor to keep beneath the ceiling. With constant radio communication and with some supplementary aid at landing fields, such as a radio beam from a parabolic reflector, the hazards of blind flying will be greatly reduced. For the present, however, the urgent need is to use intelligently those safeguards which we already have. A few more serious accidents on passenger lines and public apprehension will become chronic.

Hope for a Compromise

THE inevitable deadlock over interpretation of the Supreme Court's decision in the O'Fallon railway valuation case has come about quickly. The court said that the Interstate Commerce Commission had not given due weight to reproduction costs new in fixing a value upon the property of the St. Louis & O'Fallon Railway. It did not say how much weight should be given to reproduction costs new. Consequently, now that the case has been reopened before the commerce commission it looks as though it cannot be settled finally without another appeal to the Supreme Court unless by some happy circumstance the commission should, in its reconsideration of the case, arrive at a formula for setting a value upon the property which would be satisfactory to the railroads of the country. In the present hearings counsel for the railroads are contending that in the commission's new valuation the cost of reproduction new must be taken as a controlling factor; this despite the Supreme Court's statement that the value of many railroads may be found to be far below the cost of reproduction new. This makes it look as if they fear that the commission will go through the formality of considering the cost of reproduction new only to reject it for some lesser figure. By taking one extreme position the attorneys for the railroads may hope to influence the commission to find a value between their extreme view and that of giving no weight to reproduction cost new. A compromise favorable to the railroad might conceivably be much more advantageous to them than another appeal to the Supreme Court after the commission has gone through the formality of considering the cost of reproduction new without giving it much weight.

Contract Bungling

MANY of our readers will note with interest the decision of a San Francisco court, recorded on another page, awarding costs, interest and anticipated profits to a contractor forced to abandon a job because of an intolerable situation created by a duplication of inspection. Two major faults underlay the trouble in this particular instance, but the same faults are found on many contracts, causing annoyance, interruption and loss to the contractor. These faults were poorly drawn specifications and a duplication of inspection authority developed after the job had started. Specifications called for concrete of definite strength to be made from definitely stated proportions of aggregates—an impossibility except in rare instances—and furthermore failed to state at what age the concrete was to reach the desired strength. Carelessness rather than ignorance is responsible, in most cases, for loosely drawn specifications. An architect or engineer capable of designing and supervising the construction of a structure should be able to write an intelligent and adequate set of specifications. In the case in question the contractor yielded to the requests of a second inspector to change the mix several times, but elected to abandon the contract when the demand was made to tear out and replace certain portions of the work accepted by a first inspector. A contractor is necessarily working under restrictions and handicaps imposed by the terms of contract, specifications and municipal and state codes and ordinances. Once he enters into an agreement to work under these known stipulations he should not be subject to conflicting inspection or supervision authorized by the owner. This case represents an example of con-

tract bungling. In the interest of not only the contractor but also architects, engineers and owners, such bungling should be eliminated.

New Demands on Bridge Piers

AN INTERESTING chapter is added to the annals of deep bridge-pier construction by the foundation work for the Southern Pacific's bridge across Suisun Bay, whose ingenious methods are outlined this week. Deep water, great depth to rock and a desire for greatest assurance of sound construction because of the frequent occurrence of earthquakes in the region of the bridge determined the procedure. An artificial island of sand was built in a steel cylinder sunk into the mud bottom, and the pier was then sunk through the sand by open dredging. The principle of building up land to provide dry going for caissons or piers is not new, but according to present recollection it has never been used in such deep water or with the aid of steel confining cylinders. Its application here reflects the ingenuity and resourcefulness which marks the history of bridge-pier construction and which has made the art one of the most highly developed in the whole range of civil engineering. But even more noteworthy than the construction methods is the deliberate planning of the piers as well as the bridge itself for resistance against severe earthquake disturbance, calculated by the fullest seismic data available to science. Representing the recognition of service demands of a new kind, it testifies to the clear vision and courage of the engineers. So far as we know only the near-by highway bridge over Carquinez Straits was designed for earthquake hazards, and this in lesser degree than the Southern Pacific structure. Such advance of bridge-engineering thought justly takes account of the strategic dominance of bridges, especially on main railway lines.

Road Builders Face Association Reformation

TWO weeks ago the divisions of the American Road Builders' Association held their annual convention and exposition. They were larger than ever before. It has taken pages in this and the preceding issue of *Engineering News-Record* merely to epitomize the principal convention proceedings and to enumerate the exhibits. There were a thousand printed pages of reports and discussions and twice a thousand exhibit items. There were twenty half-day sessions of the divisions of the asssociation. There was a formally registered attendance of perhaps 20,000.

Plainly, the American Road Builders' Association has attained large stature. But with size, looseness of growth has developed, and at the same time the tasks to be done have grown so great as to require the firmest determination. It follows that the most immediate task of the association is to organize itself.

The membership of the association includes only a small proportion of the engineers officially in charge of public roads work. Only a handful of the many contractors building roads are members. Manufacturers are members only as members of an associated division. In all there are only about 3,600 members. Membership is easy to secure; the dues are nominal and the requirements are insignificant. No prestige attaches to membership; it is not treasured as a distinction. For committee work the association goes far outside its registered members. Funds from dues are only a fraction of the association income, which is largely a contribution from an association separately organized and acting voluntarily and somewhat patronizingly as a division of the roadbuilders' body. Such, tersely, is the unsound and insecure structure of the organization dedicated to the roadbuilding industry.

A similar looseness of organization concepts is presented in the reaching out of the association for coverage in highway activities. Incursions into the fields of other associations have been made inconsiderately and with no attempt at co-ordination and co-operation of effort for the common objective. These movements hardly claim the dignity of usurpation; they have been disorganized gropings for wider activities. The results, however, have been jealousies and hatreds. These are severe assertions, but they need to be made so that the association may recognize its true state.

For a decade expansion has been the controlling thought of the association leadership. The results have been astonishing, but in large measure they have grown out of the expansion of the industry and are not attributable to inspired association thinking. But aside from its causes, expansion (as it invariably does) has brought its penalties. The asssociation has not consolidated its position after each advance. This it now has to do, by improving its qualifications for membership, by purposefully co-ordinating its work with that of other agencies and seeking their co-operation in concerted action, and by perfecting its working organization.

The substitution of year-around work and annual reports of standing and special committees for haphazard programs of individual papers has been a definite improvement. No less constructive has been the creation of a paid staff to plan committee programs, to encourage committee effort and to conduct surveys and compile facts for committee information. Trade association experience has demonstrated no more effective working tool than the committee-and-staff organization now well inaugurated by the roadbuilders. Planning and control, however, are essential to its usefulness.

In brief, a board of strategy is necessary if the working organization is to capitalize its efforts for the greatest accomplishments. Manifold urgings from association members that this and that question shall be made an immediate subject of study will ruin the chances of accomplishment of the best working organization. The corrective is a budgeting and planning board to appraise the relative importance of tasks and concentrate committee and staff work on their performance. This is not executive work—even if the association executives were not occupied with larger questions of organization and management.

In the American Road Builders' Association the evident outstanding requirement is consolidation of its financing and a positive tightening up of its organization. A parallel task is to raise the qualifications for membership and establish membership as an essential of association work. Thought requires to be directed to knitting into a homogeneous whole the present tenuously held divisional parts. Even withdrawal from part of its present activities may be desirable. At least its work in many fields into which it has reached should be co-ordinated with the association and governmental agencies now acting in those fields. As a body it needs to harden its muscles and quicken its reactions and not to increase stature and add to its flesh.

Representing the whole highway industry, the road-builders' association has an opportunity for constructive performance such as faces few bodies of its kind. It has developed marvelously in the last decade, from a discouraged and apathetic group to the most comprehensive organization in the engineering world. All credit is due the men who have inspired and labored for this growth. The present reflections are set down in order that their great accomplishment shall not fall to pieces by failure to realize that a new line of organization work is now required. If the leaders of the industry will be as alert to grasp the present need for action as they were to undertake rebuilding ten years ago, there is no high accomplishment to which the American Road Builders' Association may not aspire.

Desperate Measures

DRIVEN to the last ditch in financing current expenditures, officials of various Chicago governments, and it has a score or more, have tried various expedients to pay employees. As might be done in some South American country, more attention is being paid to getting additional temporary loans than to placing the house in order and guarding against default on bond coupon payment. Once the default takes place—and of this the officials seem oblivious—Chicago bonds are immediately and automatically debarred from purchase by certain savings banks and trust and insurance companies.

Back and forth between mayor and council has gone the city budget, with the former vetoing the set-up of the latter. On the third submission to him the mayor let through a budget of about $55,000,000 instead of continuing his insistence on adding some five millions over and above the expected revenue for the year. On Feb. 4 a tax levy ordinance based on this budget will be passed and then bidders on 1930 tax anticipation warrants will be sought. The hunt for bidders promises to be interesting and may be futile, as some 180 millions of the same kind of paper already rest in the banks, no taxes having been collected for twenty months. So much for the city of Chicago, where 18,000 employees had more than $4,000,000 due them the middle of January.

Cook County, whose treasury is also down to bedrock, has embarked on the novel expedient of handing out tax anticipation warrants instead of salary checks, leaving the employee to the tender mercies of whatever agency he can find to honor paper the county itself cannot sell in bulk lots. A tax anticipation warrant is a promise to pay the face value of the document, with 6 per cent interest, when the 1930 taxes are collected. The 1928 taxes are not yet decided upon (see *Engineering News-Record*, Dec. 19, 1929, p. 956). As for the school board, whose budget is more than $100,000,000, no brilliant ideas seem to have been evolved.

Meanwhile a bankers' committee headed by Silas H. Strawn has undertaken to collect a pool of some $20,000,000 from the large taxpayers in exchange for 6 per cent tax-anticipation warrants. It is proposed to parcel out this money only to the most needy agencies of the local governments. As the amount is less than 10 per cent of the total budget of the three governments, they cannot live long on this sum. Thus the plan of starving the administration to rid the city of waste, inefficiency and unsound financing may now be realized. This sends cold shivers down the backs of the various officials, caused by fear that their extravagance and mismanagement will be shown up.

Moves toward a revamping of the financial procedure which will bring about a closer relation in time between tax collections and corporate expenditures are under way by several political and financial groups. The bankers' committee holds that there is no use in going to the state legislature for relief until a definite program has been worked out to which the major elements of government will agree. Chicago has long been due for such a reorganization and now seems to be a golden opportunity.

Perhaps the city needs an administrator of engineering training and straight thinking. The association of commerce has just elected an engineer as its president. But whether the Moses that leads Chicago out of its jungle comes from the professions or from business, he will need not only vision and wisdom but much backbone.

Increasing Capital From Earnings

A FUNDAMENTAL principle of sound utility financing is stressed in a discussion of depreciation of railroad property by J. P. Snow, former chief engineer of the Boston & Maine Railroad, published in this issue. It is that additions to the facilities of a utility must not be paid for out of earnings. That principle was disregarded by the United States Supreme Court in its recent finding in the Baltimore street-railway rate case—the court being far from unanimous in its decision, it should be said in fairness.

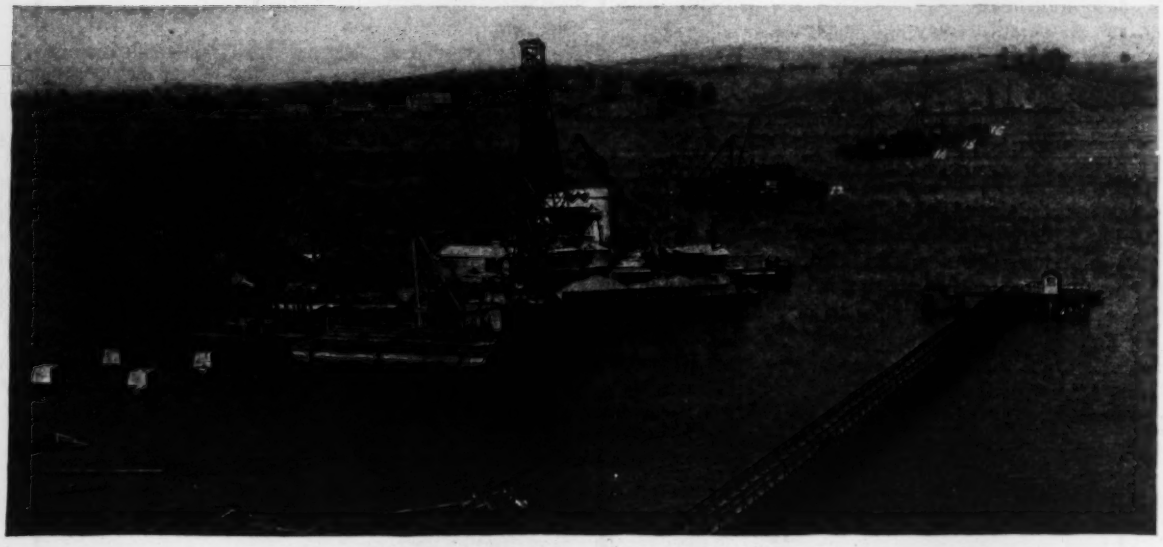
The court said that an allowance for depreciation should be computed on the basis of reproduction costs new, not on the basis of original costs. To demonstrate how such a method works to the disadvantage of the ratepayer, it is only necessary to consider how it applies to a piece of utility equipment which has increased 100 per cent in cost between the time of its purchase and the time of its replacement. According to the method of accumulating a depreciation reserve approved by the Supreme Court, the stockholders will not be required to find new capital to replace the worn-out equipment despite its greatly increased cost because, over a period of years, they will have taken from earnings sufficient money to offset its original cost and to pay the increment in price. Thus, when the new equipment goes into service the ratepayers, having provided half its purchase price, will be required to pay the stockholders interest upon its full value, over 7 per cent upon the cost of the new equipment, according to the court's findings in the Baltimore rate case, or over 14 per cent upon the stockholders' original investment. The unsoundness of this method of allowing for depreciation appears so obvious that, as Mr. Snow predicts, the Supreme Court must reverse itself on the subject at some future date.

Computation of depreciation upon a complicated structure like the property of a public utility is not a simple matter if adequate provision for replacement of worn-out equipment and for taking advantage of obsolescence of equipment having a long service life still unused. It can, however, be worked out with fairness to the utility without such a heavy penalty being placed upon the ratepayer as is placed by the method favored by the Supreme Court. Mr. Snow's discussion is directed toward the depreciation of railroad properties. It shows how that complicated problem can be worked out with fairness to both sides. Similar methods should then be applicable also to other utilities.

Pier Construction for the S.P. Railroad Bridge Across Suisun Bay

Open Caissons Used in Depths of 143 Ft. Below Low Water—Artificial Sand Islands Within Steel Shells 81 Ft. in Diameter to Be Employed in Sinking Caissons for Eight Piers

By C. R. Harding
Assistant to the President, Southern Pacific Company



PIER CONSTRUCTION VIEWED FROM SOUTH SHORE
Shaft of pier 11, completed, in the foreground

CONSTRUCTION is well advanced on the substructure for the $12,000,000 double-track bridge which is being built across Suisun Bay in California to replace the car ferry that has carried Southern Pacific trains across that body of water since 1879. Bedrock depth of 143 ft. below low water made it necessary to program pier construction on this project with particular care. For the deeper piers a scheme that has come to be known as the sand island method was devised and thus far has proved wholly satisfactory in application. Open cofferdam construction to a depth of 58 ft. below high water also is being used. Descriptions of both methods are included in the following.

In determining the location and design of the bridge, consideration was given to the proximity of earthquake faults and the probable intensity of shock that may be expected therefrom. The findings of noted geological and seismological authorities engaged in this study revealed the presence of two faults not far from the ferry crossing, in whose general location the bridge was needed.

One of these, known as the Southampton fault, lies about a mile west of Martinez and extends northwesterly along the axis of Southampton Bay. As this is an important fault with large displacement, it was found extremely undesirable to locate the bridge across it.

The other, or Martinez fault, passes through the town of Martinez, but cannot be identified on the opposite shore. Its projected course under the water extends in a northeasterly direction toward Goodyear and, if existent, passes Army Point about ¼ mile from the shore line. Whatever displacement has occurred has been small and it was felt that the site selected for the bridge, across the lower end of Suisun Bay from Suisun Point to Army Point, was a safe one.

In order to determine the depth and character of underlying rock and to preclude the possibility of locating piers on a fault line, a series of borings was made across the proposed bridge site. These borings showed a maximum water depth of 55 ft., mud to a depth of about 90 ft. below low water, and rock at a maximum depth of 143 ft., averaging 116 ft. below low water. The material between mud and rock, in descending order, was sand or clay and firm gravel. Decision to carry the piers down to rock was prompted by the great depth of mud and the necessity of providing for earthquake effects.

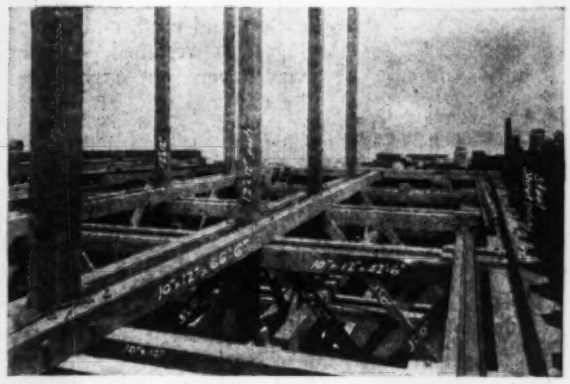
The superstructure of the bridge will consist of ten steel trusses with approach viaducts on either end, giving a total length of 5,603.5 ft. between abutments. Clearance above mean higher high water will be 70 ft. for the fixed spans and 135 ft. under the lift span when raised.

In addition to abutments and a total of 22 pedestal piers under approach viaducts, the substructure includes two piers (10 and 11) constructed in open cofferdam and eight piers (12 to 19, inclusive) constructed by a combination of the open dredging and open cofferdam methods.

A total of about 105,000 cu.yd. of concrete and 1,500 tons of reinforcing steel will be used in the piers. Pier

13, the deepest, will be approximately 214 ft. high from bedrock to bridge seat and will contain about 13,500 cu.yd. of concrete and 175 tons of reinforcing steel.

The bases of piers 10 to 19, inclusive, are to be 38x60 ft. in plan, except that the lift span piers (12 and 13) will be 40 ft. instead of 38 ft. wide. The sides will rise vertically to El. —20, at which height a shaft of smaller sections will begin. The abrupt change in section at the beginning of the pier shaft was unavoidable in view of the method employed in sinking the deeper pier bases, it being essential that the dredging wells have vertical faces so that free passage would be provided for the dredging buckets while removing material from beneath the piers.



BRACING AND STRUTTING IN COFFERDAM OF PIER 11
This bracing was framed and sunk within the cofferdam after closure of the latter.

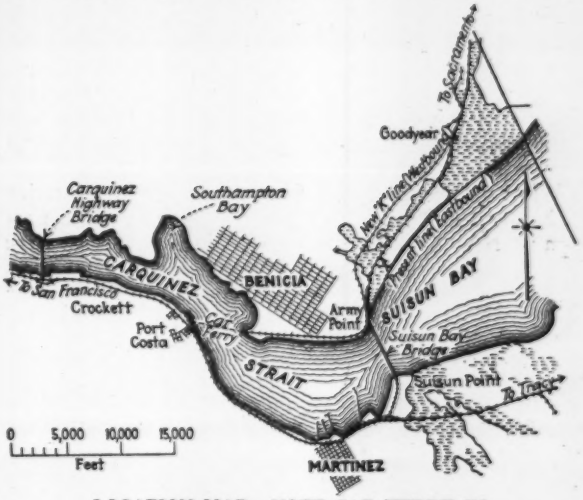
Earthquake history in the vicinity indicates that it is reasonable to expect shocks during the probable life of the bridge, although of course there are no definite data as to what forces such shocks would exert on the bridge. Ordinarily, pier bases of the size used for the Suisun Bay bridge would require no steel reinforcement, but in order to provide resistance against earthquakes it was decided to use not less than 30 lb. of reinforcing steel per cubic yard of concrete in the pier bases. Shafts likewise will be heavily reinforced.

Vertical and horizontal reinforcement is being placed around the edges of bases, dredging wells (piers 12 to 19) and shafts of the piers. At El. —20, where the abrupt change in section occurs, the steel will be extended from the pier base into the shaft above. Reinforcement consists of ¾-in. and 1-in. square and round deformed bars embedded 8 in. at edge of pier bases and dredging wells and 24 in. at edge of pier shafts.

Cofferdam for Pier 11—In the construction of pier 11 only a single wall of steel sheet piling was used in a rectangular cofferdam 58 ft. deep and 46x70 ft. in plan. First, falsework piling outlining the cofferdam was driven to rock in the form of a rectangle around the pier site, using second-hand Douglas fir timber that had been painted with a preservative compound. The vertical piles were 65 ft. long and were spaced about 8½ ft. on centers across the current and 14½ ft. on centers in the direction of flow. Brace piles 70 ft. long were driven to a 4 in 12 batter against the vertical piles, using two braces at corner piles and one brace at intermediate piles. The falsework was completed by bolting two sets of 12x12-in. wales to the piles, the first set being placed near the tops and the second set as far down as low tide permitted.

Deep-arch section steel sheet piling 65 ft. long was then driven around the inside waling timbers. Before closure of the cofferdam rectangle could be effected it was found necessary to use a wedge-shaped pile, due to the fact that the first piles placed had canted somewhat at the top and it was not possible to bring them to a vertical position. Two piles were cut, therefore, and their webs riveted together so as to form a wedge pile wider at the bottom than at the top. This wedge pile was placed in position and the remaining vertical closure pile driven, after which all sheet piling was driven to rock. The steel sheet piling was then bolted back to the outside walings and open excavation was made, almost to rock, by dredging through the water with clamshell buckets.

The next step, preparatory to unwatering, was the construction of the interior bracing wales, for which 12x24-in. timbers were used in combination with correspondingly heavy struts, posts and bracing, all timbers being well bolted together in eight tiers varying in height from 5 ft. at the bottom to 12 ft. at the top of the cofferdam. In order to facilitate forcing the wales down to position, a slight clearance was left between their outside faces and the inside face of the sheet piling.



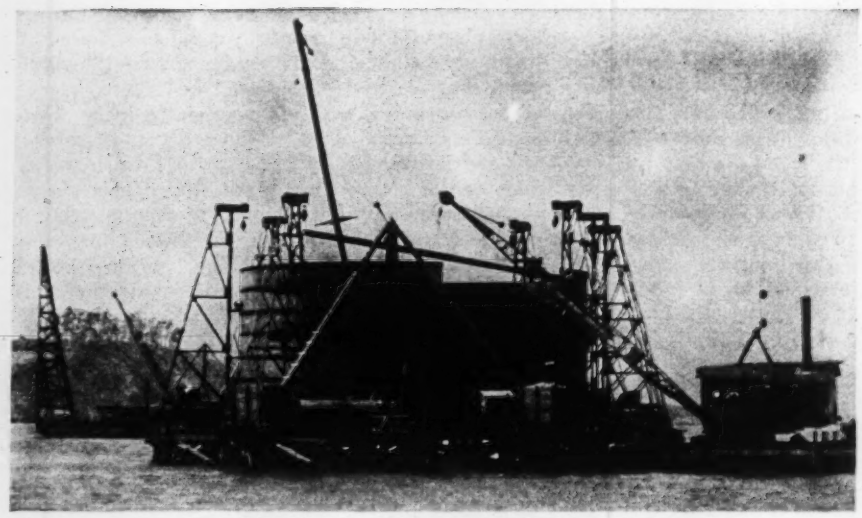
LOCATION MAP. NOTE CAR FERRY IN CARQUINEZ STRAIT

Wooden wedges were driven into this space after the wales had been put down to the prescribed level.

Struts were used in pairs, two pairs per set of wales being placed parallel with the long axis of the cofferdam and four pairs per set of wales parallel with the short axis. All struts were continuous, the longer ones being 66½ ft. in length and laid directly on the shorter struts, which were 42½ ft. long. Steel bearing plates, ½ in. thick, were used between the ends of the struts and the wales.

Vertical posts were placed at the intersections of the two systems of struts and acted as spacers between each pair. It was decided to make the posts continuous only above the third tier in order that the lower waling sets and struts might be jacked down if necessary to take care of any great differences that might be found in elevation of rock at corners of cofferdam. It developed later, however, that the jacking was not required.

The timber cage formed by the interior bracing floated of its own buoyancy and no effort was made to sink it until all framing was completed. When ready to sink, 268 tons of second-hand rails were loaded on the top set of struts.



ERECTION OF STEEL SHELL TO INCLOSE SAND ISLAND
Towers aided in the erection of the steel, which was put together in assembled section 10 ft. wide.

Mud was then jetted out from under the bottom wales, using, at first, a 2½-in. pipe tapered to a 1½-in. nozzle, average pressure at the pump being 125 lb. per square inch. A diver sent down to inspect the work reported that this jet was not very effective. The nozzle was then plugged and eight $\frac{7}{16}$-in. holes were drilled in the pipe, which resulted in more effective jetting.

When all material had been excavated and interior timbering rested on rock, the sheet piling of the cofferdam itself was driven ½ to 3½ ft. into rock. Lugs were bolted to the tops of some of the steel piles and short posts were inserted between these lugs and the top wales to hold down the timber cage. One hundred tons of the rail load was then taken off and unwatering of the cofferdam started.

Unwatering the Cofferdam—With four 8-in. centrifugal pumps working it was difficult at first to lower the water more than 2 ft. in four hours, but better progress was made as the head on the cofferdam increased. Leached copper ore was deposited in the water outside of the cofferdam and was forced by the water pressure through the interlocks, proving very effective in stopping leaks.

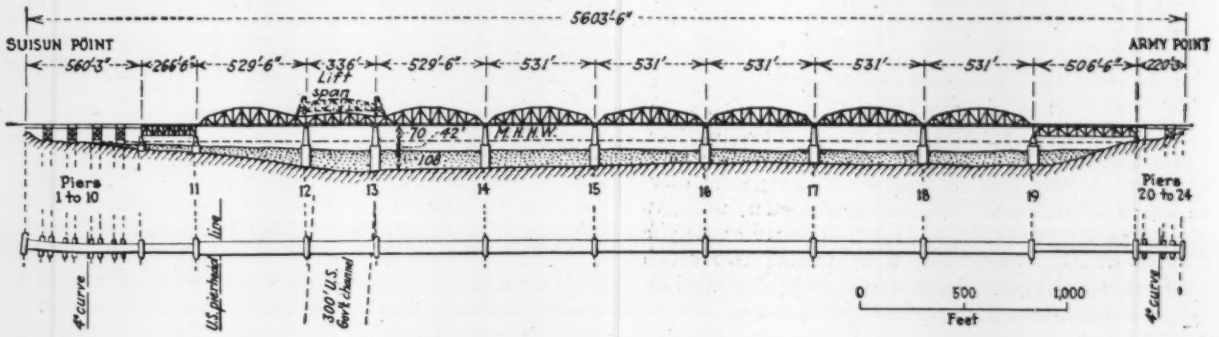
Two days after pumping started water blew in under the sheet piling at the point of closure, filling the cofferdam in about eight minutes, there having been a head of 19 ft. at the time. Failure was due to the fact that the piles on either side of the closure pile were offset at the bottom and consequently were farther apart at that point than at the top, resulting in cracking of the interlocks when closure was made.

To correct this leak, the sheet piling on the south and east sides of the cofferdam was driven deeper into rock, the average increase of penetration being 1½ ft. The outside of the cofferdam at the point of the break was backfilled with gravel (in sacks) and mud, and pumping was resumed. Water was lowered in easy stages by day and held constant at night, two of the 8-in. centrifugal pumps being placed at the second and third wales to take care of the lower water. When water level reached El. —20 use of the 8-in. pumps was discontinued and four 5-in. pulsometer pumps were installed, leakage being easily handled by one of these pumps. At the completion of the unwatering process, mud remaining in the bottom of the cofferdam was removed by dredging and by sluicing into the pumps.

The rock surface, when unwatered, was found to include shale, sandy shale and sandstone, the sandy shale predominating and being interspersed by ridges of sandstone which formed decided steps in the foundation. It was necessary to step the shale at several places in order to break up slope planes. The rock sloped from El. —46.4 at the southwest corner to El. —50.7 at the northeast corner. The rock formation was, in general, of excellent character, affording all necessary foundation requirements.

Pouring Concrete in Pier 11—Before pouring of concrete commenced the remaining 168 tons of scrap rail was unloaded. The foundation was carefully cleaned, and after footing forms were erected against the inside of the cofferdam wales, the surface of the rock was covered with 2 in. of grout.

Concrete-mixing equipment and material were floated to the site on barges, fresh water being supplied through a submerged pipe line. Wet concrete was hoisted and poured through chutes into the forms. Reinforcing steel was placed in position and care was taken to deposit all concrete in the dry. The first 6 ft. of the pier footing was poured against the forms erected against



ELEVATION AND PLAN OF BRIDGE

the waling, but above that height the base was stepped back to the prescribed dimensions of 38x60 ft.

The four lower sets of struts were left in the completed footing, as they were well below the mud line and would have been difficult to remove. All timber above was taken out as the concrete was poured, struts being boxed out to form large keys at each construction joint. Wales were braced to the concrete before struts were removed. All concrete surfaces were cleaned and washed and construction joints covered with 2 in. of grout before pouring the next lift.

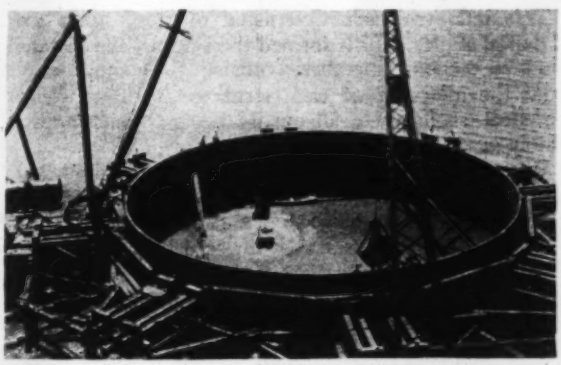
At El. —20 construction of the pier shaft was started, using steel panel forms on the north and south sides of the shaft and wooden forms on the semicircular ends. The shaft was battered 1 in 24 on the sides and 1 in 48 at the ends.

Between El. —8.0 and El. +8.0 the pier shaft was given two coats of waterproofing, after which the gate pile was pulled and the cofferdam filled with water. Pulling of sheet piling began immediately and was accomplished without difficulty, although most of the piles showed a decided bend outward in the lower 10 ft. This deformation was due to the fact that when driven the sheet piling was not exactly vertical but had an outward inclination from top to bottom. When the cofferdam was unwatered, hydrostatic pressure on the outside forced the lower portions inward. As the piles were embedded in rock, they could not be forced in at the toe, resulting in the bending described. The average penetration in rock was found to be approximately 2½ ft. This piling was used again in the construction of pier 10.

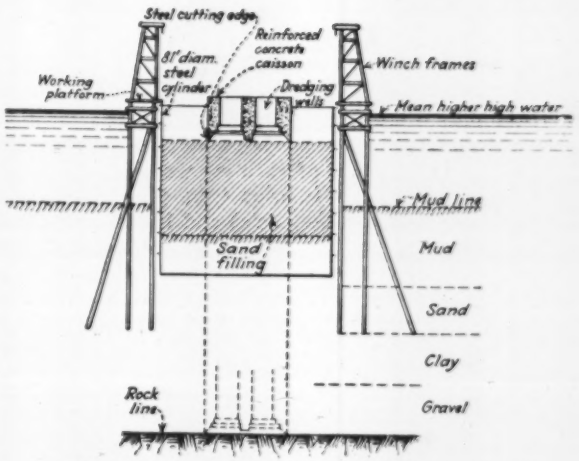
Pouring of the coping and setting of the anchor bolts completed the construction of the pier. Location of the anchor bolts was checked by triangulation, a comprehensive system having been established as a preliminary step in the work. After stripping the forms, the face of the shaft was brushed over with neat cement.

Construction of pier 11 required 4,111 cu.yd. of concrete made up of 5,582 bbl. of cement, 1,951 cu.yd. of sand and 3,426 cu.yd. of rock. Reinforcing steel weighed 43 tons, averaging about 21 lb. per cubic yard of concrete.

The first 6 ft. of footing was poured with 1 : 2.4 : 4.6 concrete, using 5½ sacks of cement per cubic yard of concrete and 6½ gal. of water per sack of cement. Above this and up to El. —4 a 1 : 2.6 : 4.8 concrete was used, with five sacks of cement per cubic yard of concrete and 6¾ gal. of water per sack of cement. From El. —4 to El. +10 the concrete proportion, by volume, was 1 : 2 : 3, using seven sacks of cement per cubic yard.



SINKING THE STEEL SHELL ON PIER 12
Dredging under way inside the shell. Note steel bracing to stiffen walls of the shell.



METHOD OF SINKING CAISSON ON SAND ISLAND

Above El. +10 and excluding the bridge seat, the concrete was the same as used below El. —4. The bridge seat was poured with a 1 : 2.2 : 3.8 mixture, using six sacks of cement per cubic yard.

The work on pier 11 was started May 16 and completed Sept. 21, an elapsed time of 128 days, of which eleven days were required for erecting falsework, 14 days for driving sheet piling, 24 days for framing, 22 days for excavating and lowering, 15 days for pumping and cleaning and 42 days for pouring concrete.

Sand Island Method—Eight piers (12 to 19, inclusive) are being constructed by a method never before employed, the author believes, in deep water work. Briefly, this consists in sinking a steel cylinder, 81 ft. in diameter, from an octagonal dock built around the pier site, the cylinder being erected in sections as it is lowered. This steel shell is allowed to sink of its own weight, and when it finally comes to rest, the mud is dredged out from the inside and the shell backfilled with sand nearly to the top. On the sand island thus formed a steel cutting edge is laid and steel forms are erected for the construction of a reinforced-concrete caisson containing six dredging wells. After the first 25 ft. of caisson has been poured, sand is dredged from beneath it through the wells, permitting the caisson to sink. This process is repeated, alternately building up the concrete pier base and dredging through the wells until rock is reached, each lift of concrete adding about 10 ft. to the height of the sinking pier base.

When the work has progressed in this manner until all the concrete of the pier base has been poured and while the pier base is still above water level, an open cofferdam is erected on top of the base and dredging is then resumed. When the cutting edge reaches rock, the dredging wells are sealed, and after water has been pumped out, are filled with concrete. The pier shaft is then constructed in the open cofferdam. After the cofferdam has been built the steel shell is unbolted approximately at the mud line and the upper sections are used again in the construction of other piers.

This method has the advantage that all concrete is placed in the dry, no timber is left in the pier, reinforcing steel can be properly set and the work can be carefully inspected at all times, thus insuring the highest grade of reinforced concrete in these piers.

Putting Down the First Sand Island Pier—Construction of the falsework in pier 12 consisted in driving eight sets of piles, 110 ft. long, at equal intervals out-

side the circumference of a circle 81 ft. in diameter, six vertical piles and two batter piles being used in each set, except that at the two points directly in the line of the current an additional batter pile was driven. Vertical piles were accurately spotted by triangulation before driving.

The six vertical piles of each set were driven in the form of a rectangle, 12 ft. wide (in a direction tangent to the circumference of the circle) and 15 ft. long. Four piles were driven on the inner short dimension and two piles on the outer side, the batter piles being used to brace the inner row. The projections of the short sides of these eight rectangles formed two octagons about the pier site. One vertical pile was driven at the corner of each octagon, making a total of 64 vertical piles and eighteen batter piles for each pier. In addition, seven vertical piles were used to support a stiff-leg derrick.

The piles were then capped about 3½ ft. above high water. The platform thus formed was about 15 ft. wide and the distance between inner faces of caps across the diameter of the circle was approximately 85 ft. In order to avoid interference between plumb piles and steel shell during sinking, 6x10-in. wales were placed on the inner faces of the octagon.

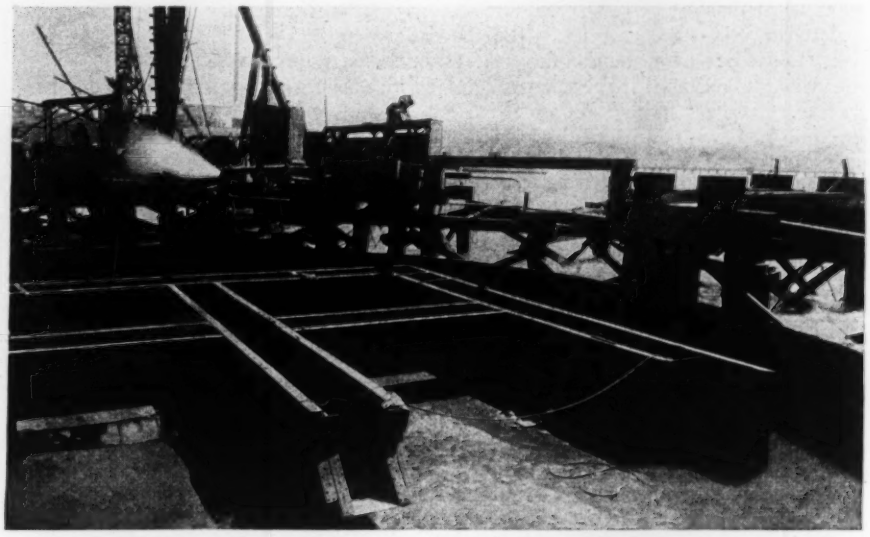
The next step was the construction of the grid seats for eight steel winch frames, which were built of heavy timbers over the eight sets of piling at the midpoint of each side of the octagonal dock. The winch frames were made in the form of steel towers surmounted by a 21-in., 104-lb. I-beam from which a hoisting pulley was suspended. The towers were about 44 ft. high with inner faces vertical. For the inner legs 6-in., 22.5-lb. H-beams were used, while the outer legs consisted of 4x4x⅜-in. angles. The towers were of rugged construction, well braced with struts between towers, and each one was anchored to the falsework by tie bars and rods.

Mounted on suitable supports within the base of each tower and radial to the circle was placed a 27-in., 112-lb. I-beam, movable toward and away from the steel cylinder and resting on a 2-in. bearing plate at the inner end. These beams served as supports for the timbers on which the first sections of the steel shell were erected and also held the shell in position after lowering or during erection of additional sections, it being possible to connect the beams to the shell at any elevation by removing bolts in the shell splice plates.

The outer ends of these beams were held down by two 1-in. tie rods passed through a 10-in., 20-lb. channel on top of each beam. Timber supports for the bottom course of the cylinder consisted of two sets of 12x12-in. timbers, one set resting upon the inner ends of the movable I-beams spanning from beam to beam and the other set resting on the pile capping, these two sets being spanned in turn by four shorter cross-members upon which the steel shell rested.

Erection of the Steel Shell—Then followed the erection of the steel shell, material for which was brought to the pier site as an assembly of steel plates 10 ft. wide and of a length equal to one-eighth the circumference. Each assembly was made up of two ½-in. plates 5 ft. wide, lapped 3 in. and provided with a 5x3½x$\frac{7}{16}$-in. horizontal reinforcing angle along the lap. Similar angles also were riveted to the top and bottom of each section, field connections at horizontal joints being made through these angles, which were on the outside of the shell. Vertical field joints were butt connected, using 23x½-in. plates on both sides of the shell. All field connections were bolted and all other connections shop riveted.

The bottom of the shell was reinforced with a 9x½-in. plate extending around the inside circumference, the horizontal reinforcing angle being omitted at this point. In addition, the bottom 5 ft. of the shell was strengthened with 3x3x⅜-in. vertical stiffener angles on the outside, six stiffeners being used in each 45 deg. section. In order to keep the shell truly circular and to prevent distortion by reason of possible unequal pressure during sinking, interior horizontal truss bracing was placed halfway up each of the 10-ft. sections, with the exception of the bottom section being so arranged that an unobstructed rectangle, 69x50 ft. in plan, was left at the center of the shell.



ERECTION OF STEEL CUTTING EDGE OF THE CAISSON
Steelwork was assembled on the sand island within the protection of the cylindrical shell.

This interior bracing consisted of steel struts made of paired angles, which formed the sides of the rectangle, and two diagonal members, consisting of single angles, from the midpoint of each strut to the inner face of the steel shell, these diagonals being placed approximately at right angles to each other.

When the first 30 ft. of shell had been erected and suspended from the winch frames, the timber supports were removed from beneath it and the movable I-beams slid back. The shell was then lowered by means of hand winches mounted in each tower, until the first 15 ft. was under water. It was held in this position by sliding the I-beams forward and bolting their inner ends to the shell.

Three more 10-ft. sections, including the interior bracing, were then added and the shell again lowered, sinking of its own weight into 21 ft. of mud but leaving

its top a few feet out of water. An additional 10-ft. section was added later in order to prevent extremely high tides from washing into the cylinder.

When the bottom of the cylinder was about 50 ft. below lower low water, clamshell buckets were used to dredge a 10-ft. depth of mud from inside the shell, after which the interior struts were removed by a diver and the cylinder was backfilled with sand to an average elevation of about mean lower low water, approximately 9,500 cu.yd. of sand being required for this purpose. The top of the sand was leveled with clamshell bucket and by jetting, after which the cylinder was unwatered to a depth of about 12 ft. below high water.

Putting Down the Caisson—The next step was to erect on the sand island the cutting edge of the caisson which was to constitute the bottom of the outer edges of the pier base as well as of the cross-walls separating the dredging wells. Around the outer edges of the pier the caisson walls in this first section, or cutting edge, were 3½ ft. wide at the top, tapering to a width of 6 in. at the bottom and 4 ft. 8 in. deep, a 6x4x1-in. angle being riveted to the bottom of the cutting edge proper to facilitate sinking. Under the cross-walls the steel members had a uniform width of 3 ft., but did not extend down to the level of the cutting edges under the outer walls, the latter being 13 in. lower than the intermediate members.

Structural steel used in the cutting edge consisted principally of ⅜-in. web plates with 6x6x½-in. angles at top and bottom. Diaphragms of 9x⅜-in. plates with 4x4x⅜-in. connecting angles were placed at about 4-ft. intervals in the outer shoe and at the midpoint of the cross-members. At the four corners of the cutting edge, 8x8x½-in. angles were used on the outside and 6x6x½-in. angles on the inside. Horizontal corner braces, consisting of one 3x3x⅜-in. angle, were riveted to the top angles of the outer shoes. Total weight of steel required for the construction of the cutting edge was approximately 98,000 lb.

Included in the assembly of the cutting edge was a bracing and reinforcing system adequate to secure rigidity as well as bond with the structure above. Pouring concrete was the next step. Steel forms were erected around the cutting edge and around the faces of the dredging wells. The base of the pier was 40x60 ft. in plan, and the six well openings were each 10½x11⅔ ft. The thickness of the outer walls of the caisson was 6½ ft., while the walls separating the dredging wells were 6 ft. thick. The inside of the cutting edge was stepped inward in two steps to a height of 18 in. above the top of the shoes, these forms being removed when concrete had been poured to 25 ft. above the cutting edge.

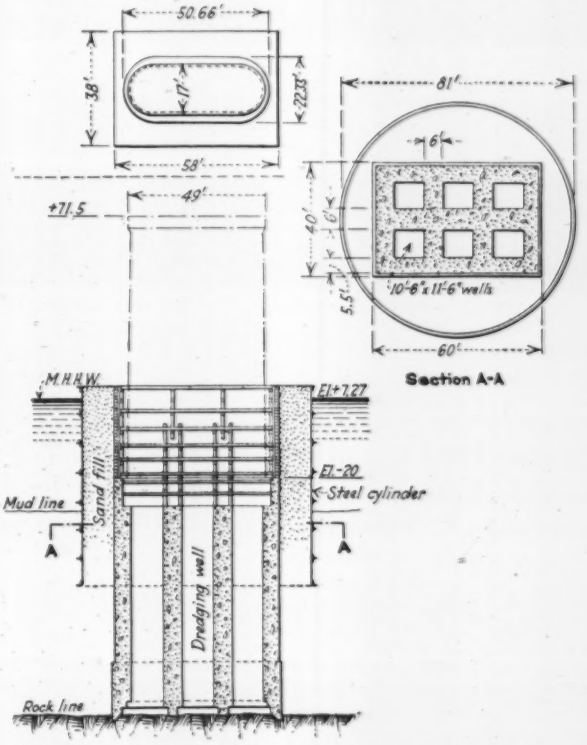
The first pour of concrete was a 15-ft. lift, including material poured into the shoes. Subsequent lifts were 10 ft. high. After each pour the caisson was lowered by dredging through the wells, well forms being removed before dredging started. Construction joints were well keyed by sinking wooden troughs in the top of each pour, and surfaces were cleaned and grouted.

At an elevation of 20 ft. above the cutting edge the pier base was stepped back 1 ft. on all sides, giving a 38x58-ft. section from this point up to El. —20. This was done in order to reduce skin friction on the sides during sinking.

For the first 6 ft. of concrete poured a 1 : 2.1 : 4.1 mixture was used, averaging 5¾ sacks of cement per cubic yard and 6½ gal. of water per sack of cement. The remaining concrete, up to El. —20, was a 1 : 2.6 : 4.8 mixture, using five sacks of cement per cubic yard and 6¾ gal. of water per sack of cement.

Pouring was done by day and dredging was carried on at night. A 10-ft. lift, averaging well over 500 cu.yd. of concrete, could be completed at one pouring. The steel forms were easily raised and bolted in position for succeeding lifts. With two rigs working, about sixteen hours were required to sink the caisson 10 ft. through sand or mud.

Some difficulty was experienced in keeping the caisson vertical and in exact position during sinking, but tendency to tilt was corrected by regulating the dredging. If the pier was out of position, it could be inclined



PLAN AND SECTIONS OF TYPICAL SAND ISLAND PIER

slightly by dredging through the wells on one side only, thus bringing it back to proper location, and then plumbed by dredging through the opposite set of wells. The maximum deviation was 12 in. out of line and 19 in. out of level, all of which was corrected. No abrupt change was noted during the transition from sand to mud or when the caisson passed below the steel shell.

At an elevation of 73 ft. above the cutting edge, a recess was left in the top of the pier base for the distributing block, which will be poured after the dredging wells have been filled with concrete. This block will be 53 ft. long, 33 ft. wide and 10 ft. thick, leaving a wall 2½ ft. thick around the block. Anchor bolts were set at about 6-ft. intervals in the top of this wall for the purpose of holding down the timber cofferdam in which the pier shaft is to be constructed.

Two sets of struts, to act as part of the cofferdam, were wedged tightly against the inside faces of the walls which formed the upper 10 ft. of the caisson. Each set of struts consisted of two longitudinal and four transverse 12x12-in. timbers, placed above the partition walls of the dredging wells in order not to interfere with dredging operations.

Cofferdam Attached to Pier Base—Construction of the cofferdam started when the top of the caisson, at a point 83 ft. above its cutting edge, was only about 2 ft. above high water. Dredging was discontinued during construction of the cofferdam.

The cofferdam walls, which had a total height of 30 ft., were made up of 12x12-in. timbers, in horizontal layers calked and treated against teredo attack. Successive courses, or sections, varied in height from 5 to 10 ft. Each successive layer of timber was secured to the preceeding layer by ¾-in. drift bolts, 18 in. long, spaced about 3 ft. apart.

At about 12-ft. intervals, 10-in., 15.3-lb. channels, 20 in. long, were placed flange upward on top of cofferdam wall and connected by two 1-in. square bars to the anchor bolts previously set in the top of the concrete caisson. These bars passed through holes in the webs of the channels and were held in position by nuts on the upper ends. They extended down on either side of the caisson wall to the anchor bolts and, when tightened, served not only as a means of anchorage but also to close the joints in the timbering.

With the cofferdam completed, dredging was resumed. Sinking proceeded slowly, as only one rig was available at that time, the height of the cofferdam wall making it impossible to use the derrick barge for dredging. At this stage of the work mud was excavated to an average depth of 5 ft. below the cutting edge without producing caisson settlement. It was deemed inadvisable to dig deeper than 6 ft. beyond the cutting edge. Three charges of dynamite were fired to start the caisson moving, and although it did not settle immediately, soundings showed that the mud had caved into the pockets dredged below the wells. Dredging was continued and the pier lowered in easy stages, dynamite being used whenever the caisson did not show satisfactory movement by the time excavation had been carried 6 ft. below the cutting edge.

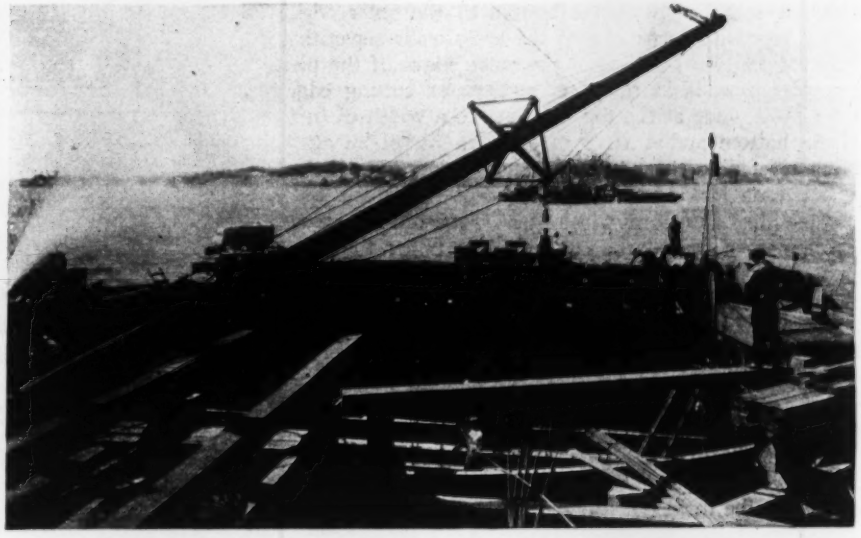
The sinking proceeded through blue clay and sand until the cutting edge reached El. —99.3 with holes in dredging wells about 4 ft. below cutting edge and on rock. At this stage of the work a diver was lowered to report on bottom conditions. Each well was carefully explored and the depths of rock were reported by telephone as the diver proceeded around the sides of the well.

Material was then jetted from under the pier and several charges of dynamite were used to assist in the sinking, the cutting edge finally coming to rest at El. —105.5 (106.3 ft. below lower low water). The diver reported that the outer shoes had penetrated to a depth of about 1½ ft. in the hard shale and that approximately 30 per cent of the partition walls rested upon rock. Foundation conditions were entirely satisfactory. The dredging wells were then sealed with concrete to a height of about 30 ft. above the cutting edge, the concrete being placed under water through tremies.

Later the dredging wells were unwatered and concrete was placed in the dry, being keyed to the caisson by means of recesses left in the walls of the dredging well during construction. When the wells were closed, the distributing block was poured and work on the shaft was started.

Progress on other parts of the project up to Jan. 1, 1930, included completion of the south pedestal piers, and piers 10 and 11. Pier 12 had been sunk to bedrock, piers 12 to 17 inclusive were in various stages of construction and the remaining piers were to be started soon.

The Suisun Bay bridge is being built under the direct supervision of the writer and W. H. Kirkbride, engineer, maintenance-of-way, with the assistance of G. W. Rear, engineer of bridges. All field work is in charge of H. I. Benjamin, assistant engineer of bridges. Design of foundation and superstructure is being checked by S. A. Roake, chief designer.



ERECTION OF CONCRETE FORMS FOR THE CAISSON IN PIER 12
Edge of steel shell in foreground. Rectangular steel forms for the dredging wells are removed before caisson sinks.

Moran & Proctor are consulting engineers for foundation work; Waddell & Hardesty are designing the lift span and towers; Ralph Modjeski was consultant in the preliminary study of the project. Substructure is being constructed by Siems, Helmers & Schaffner, Inc., of St. Paul, under the direction of N. F. Helmers, vice-president; M. F. Clements has been engaged as this concern's consulting engineer. The American Bridge Company will furnish and erect the superstructure.

Canadian Railroad to Extend

The Temiskaming & Northern Ontario Railway will be pushed on to James Bay. Construction is to start in the spring and the line will be completed to the projected terminus at Moose Factory before the close of 1930 if practicable. The total distance is a little short of 100 miles. The first intention is to rush construction from Coral Rapids, present northerly terminus, to Blacksmith Rapids, heart of the new lignite coal field, a distance of 30 miles. The road will then be extended on toward James Bay with the hope that Moose Factory can be reached by the end of the year.

Regional Planning, Engineering and the Master Plan of Los Angeles County

Methods by Which Regional Projects Are Initiated and Put Into Effect— Speed of Development Requires Immediate Plans Ahead of Final Master Plan

By William J. Fox
Chief Engineer, Los Angeles County Regional Planning Commission

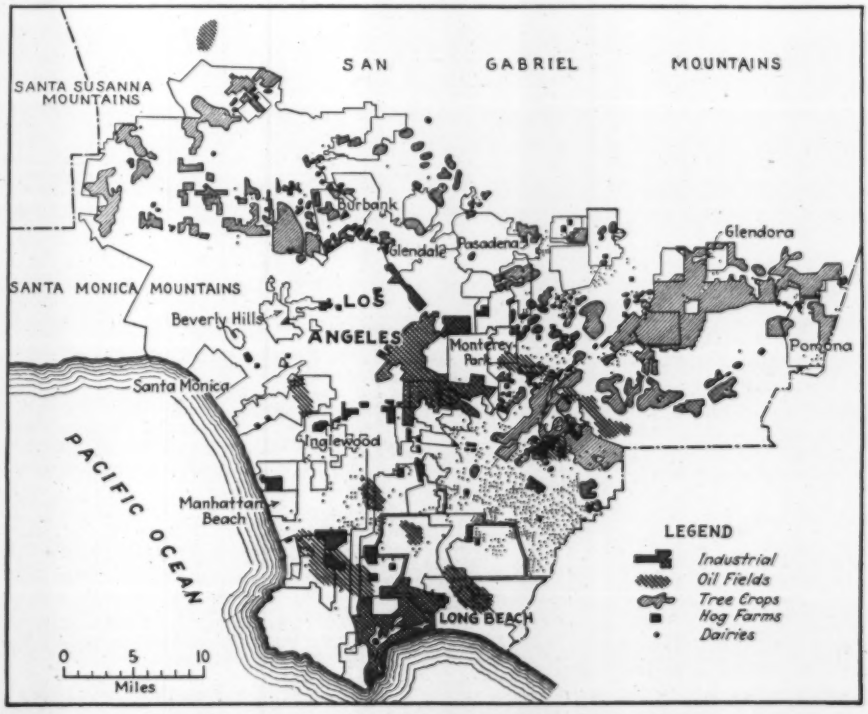
First in the United States to create a planning commission, Los Angeles County has gone far in co-ordinating its planning of engineering under a single head. Mr. Fox, in the following article, deals mostly with the methods by which this has been done instead of describing the plan, the latter being chiefly of local interest. Certain examples are given of subdivision work, grade-crossing control and highway location. Earlier articles on regional engineering work in *Engineering News-Record* are: (1) Introductory, Oct. 4, 1928, p. 496; (2) Chicago Region, Nov. 22, 1928, p. 758; (3) Milwaukee Region, April 11, 1929, p. 585; (4) New York Region, June 6, 1929, p. 907; Westchester County, p. 442, Sept. 19, 1929.—Editor.

In LOS ANGELES COUNTY planning has long been considered good business and sound engineering. It is as sound and expedient to plan the development of cities as to design a bridge, a portion of a highway or a water system. Planning is an amplification of these fundamental engineering practices: the accumulation of data, their reduction to formulas and their application to design for the accomplishment of predetermined objectives. These objectives are set forth in definite plans, which are given official recognition, stabilized by public opinion and supported by methods of procedure consistent with the most modern knowledge of economics.

Planning is primarily a function of the engineer, but in city and regional planning the engineer must work with the building and the landscape architects, the attorney and members of other professions. Regional planning in Los Angeles County can be defined as the scientific study of the problems of physical growth of separate communities which have common interests, the reduction of these to a co-ordinated, sound, economic plan, with methods of procedure for its execution.

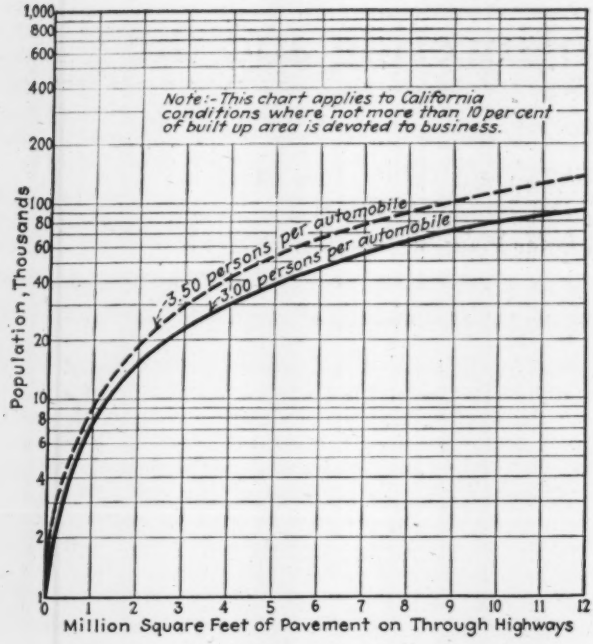
When the Regional Planning Commission was created by the Board of Supervisors of the County of Los Angeles, in 1922, it became a part of the county government, the first of its kind in America. By reason of its official character it is having some rather unique experiences in combining the theory of planning with actual administrative practice. Its status demands that it have plans ready for immediate application and at the same time continue the basic studies leading to the development of a really complete plan for the future.

Los Angeles County has an area of 4,115 square miles. Of this, roughly one-third is open territory, one-third is mountainous and one-third is intensively used. The population in 1920 was 936,000 and in 1927 it was 2,270,000. Property values for similar periods were 1,275 and 3,337 million dollars. The planning commission co-ordinates the work of 44 municipal governments, 25 local city planning commissions, 101 chambers of commerce, 63 civic improvement associations and as many highway development associations.



USES TO WHICH LAND IS PUT IN LOS ANGELES COUNTY

Finances and Staff — To plan efficiently and effectively, a regional planning commission must have adequate finances and be equipped with the best technical staff available. The achievements of a commission, fortified with a well-equipped technical staff, justify the expense involved. The Los Angeles County Regional Planning Commission has built up its organization so as to provide for each of the important phases of planning activity. The staff is headed by a director, or executive secretary, under whom is the chief engineer, to whom report heads of the


Note:-This chart applies to California conditions where not more than 10 per cent of built up area is devoted to business.
K-3.50 persons per automobile
K-3.00 persons per automobile
Population, Thousands
Million Square Feet of Pavement on Through Highways

AMOUNT OF PAVEMENT REQUIRED FOR A GIVEN POPULATION

This graph was made from a survey of seventeen towns in the San Gabriel Valley. It takes into account present and ultimate population, present and future area of pavement on through streets in accord with the highway plan to take care of ultimate development of each city.

highway, subdivision, zoning and landscape design sections. A statistical division and a staff artist also report to the chief engineer.

The elements which constitute the foundation of regional planning can be enumerated as the scientific study of highways, transportation, subdivision of land, use of property, recreational facilities, utilities and architecture. The ramifications of these basic studies are limited only by the ambitions and requirements of the citizenship.

Maps—One of the first requirements in all planning work is a proper set of base maps. In Los Angeles County the U. S. Geological Survey sheets, 2,000 ft. to the inch, with 5-ft. contours, are indispensable for general study work. Maps, 1,000 ft. to the inch, are used for the basic official highway plans. County sectional maps, 600 ft. to the inch, constitute the compiled record of the official planning accomplishment. Drawings 100 ft. or 50 ft. to the inch are used for special study work.

Highway System—Since highways form the basic framework for comprehensive planning, the first step is a thorough study of existing highway conditions. The various satellite centers of activity, either actual or proposed, are identified. A tentative framework of connecting arteries is laid out, using existing dedications where advisable, and adjusted to property lines and improvements in such a way that the best alignments, the best grades and the safest intersections are procured.

The aim is to have a major boulevard 100 ft. wide every mile on the section line and a secondary highway, 80 ft. wide, every half-mile, where topography permits. The areas embraced between the major and secondary highways are purposely designed for residential or industrial use, the minor streets being so designed as best to serve local needs. Where heavy through traffic is expected, as for instance between Los Angeles harbor and the city of Los Angeles, the frequency of major highways is increased.

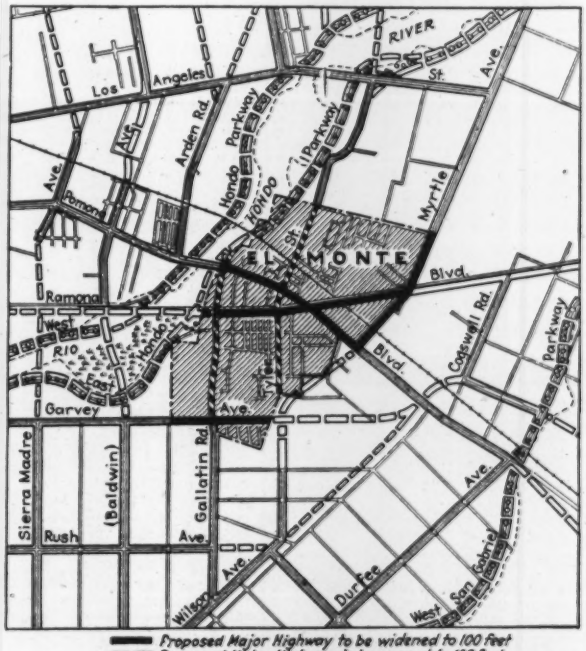
With this major highway plan calling for 3,000 miles of 100-ft. streets as a basis, all new subdivisions are required to dedicate their portion of the major and secondary highway systems, and the general character of the subdivision is adjusted to conform to the plan, to existing streets and to local physical conditions. Likewise, spur tracks, relocations of rail lines, pole lines, high-tension electric rights-of-way, airports and other permanent features are oriented to conform to the major highway plan.

During the first five years of the commission's existence 1,640 proposed subdivisions of unincorporated area were submitted to it for approval. Of these, 93 per cent of the decisions based on standard requirements and uniform procedure were accepted without appeal. The total area involved was 55 square miles. Up to Nov. 2, 1929, major and secondary highway widths on 98.36 miles had been acquired without cost in recorded subdivisions, allocated as follows: 13.27 miles widened to 80 ft., 29.25 miles widened to 100 ft., 24.58 miles of new 80-ft. highways and 31.26 miles of new 100-ft. highways dedicated.

Zoning—The first county-wide zoning ordinance was enacted in Los Angeles County Sept. 12, 1927. Building permits issued afford means of effective control over all new construction in unincorporated areas. Nearly 40 square miles of unincorporated areas near seven towns and having a population of 135,000 have been zoned. Studies are being made to zone nine other communities.

As in all growing cities, there has been a tendency to overzone for business purposes. The ratio of population to business corresponds in Los Angeles County to 100 people per 50-ft. frontage, a figure found generally over the country. Towns have zoned from 2 to 9.5 times the amount needed for the ultimate growth.

Project Initiation—In Los Angeles County the work



CITIES CO-OPERATE WITH ONE ANOTHER AND THE COMMISSION IN PREPARING THE COMPREHENSIVE PLAN FOR THE COUNTY

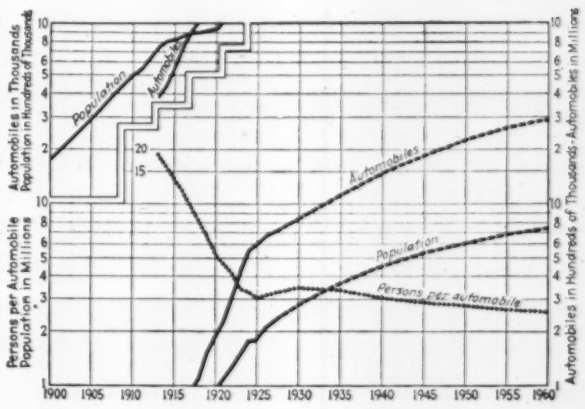
This comprehensive plan is laid out by the commission for ultimate traffic needs. It is officially adopted and used as a guide for developing major and sub-major highways in and through the city both as to width and as to direction.

of carrying out any part of the master plan—by policy—is initiated by an official petition signed by a majority of the property owners. Such a petition is issued by the county upon proper application and has upon it a financial plan and statement embracing the following information:

1. Legislative act under which the work is to be done.
2. Terms of the bonds.
3. Total assessed valuation of the district.
4. Approximate bonded indebtedness.
5. Approximate amount of bonds expected to be issued for pending work.
6. Approximate annual maintenance and operating charges of districts, including those past the preliminary stages of formation.
7. Approximate average annual payment for items 2, 3 and 4 on the basis of the current year per $100 of assessed valuation.
8. Estimated amount of bonds to be issued to pay the cost of the improvement.
9. Estimated maintenance and operating charges per year for the proposed improvement.
10. Total approximate average payment for the first year to be expected for improvements and maintenance per $100 assessed valuation, if the petition is granted.
11. Per cent of total bonded indebtedness, present and proposed, to total assessed valuation.

When the estimate is compiled the petition and an authorized map showing the proposed assessment district and specifications of the work to be done are approved by an official county committee, composed of the chief engineers of the construction department, the surveyor's department and the regional planning commission. With the approvals secured, the petition is submitted to the board of supervisors and upon its approval is permitted to be circulated.

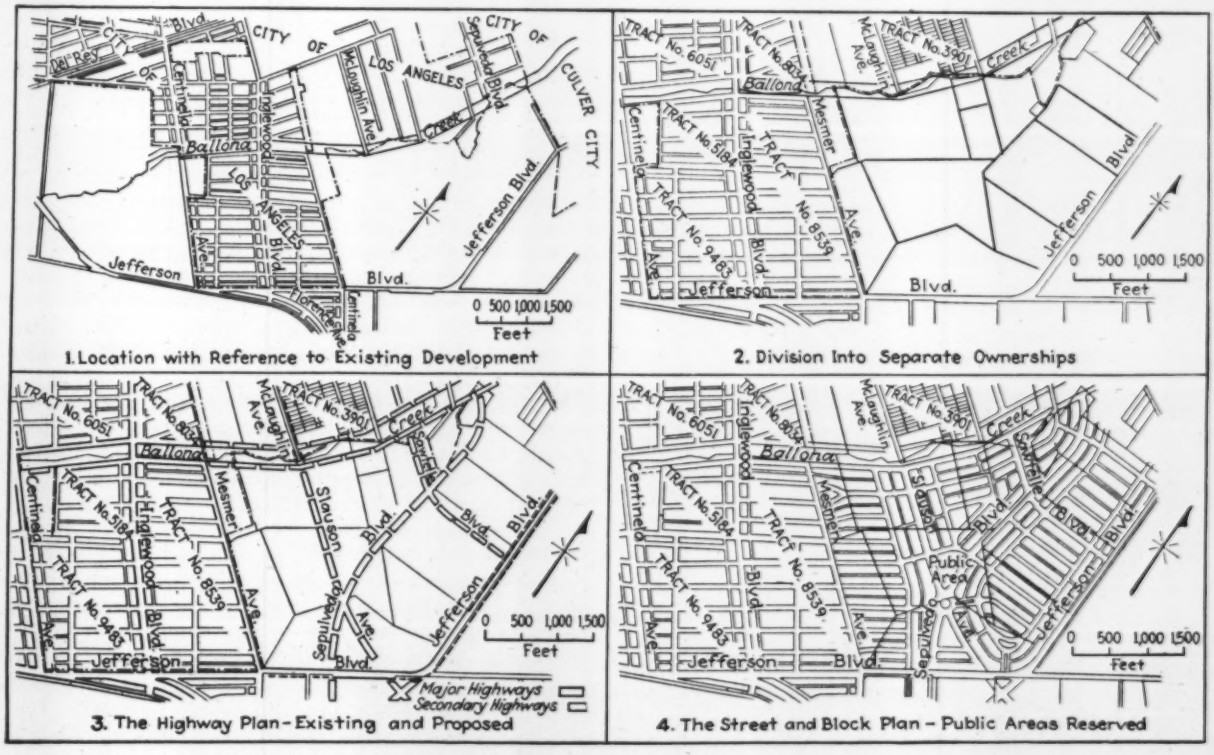
Public Opinion—Public indorsement and active support are extremely important factors, which should be kept in direct cadence with the work of planning. This is always forthcoming whenever and wherever there is


Automobiles in Thousands
Population in Hundreds of Thousands
Population
Automobiles
Persons per Automobile
Population in Millions
Persons per automobile
Automobiles in Hundreds of Thousands
Automobiles in Millions
1900 1905 1910 1915 1920 1925 1930 1935 1940 1945 1950 1955 1960

PAST AND ESTIMATED FUTURE AUTOMOBILE DENSITY

available complete information as to the objects sought and the methods employed by the commission. The office contributes regularly, to the newspapers and technical magazines, material relative to the essentials of modern, scientific planning. A bulletin is sent bi-weekly to public officials and active civic workers throughout the county. The staff artist has graphically illustrated many vital points in a forceful, attractive fashion. His drawings have been of great value in the visual presentation of some of the more complex projects, making them clear to those not accustomed to technical drawings.

The work of the highway section comes, perhaps, the most directly to the attention of the public, because roads are the first need in opening up new territory. The subdivision section's work is closely co-ordinated with that

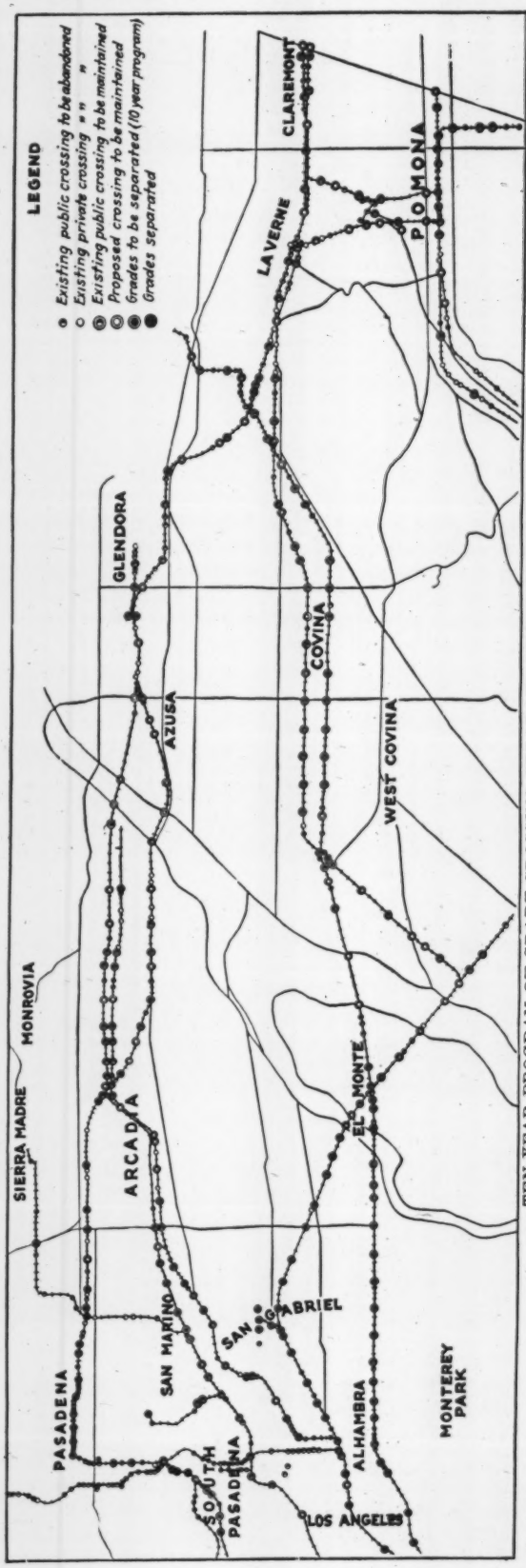

1. Location with Reference to Existing Development
2. Division Into Separate Ownerships
3. The Highway Plan - Existing and Proposed
4. The Street and Block Plan - Public Areas Reserved
Major Highways
Secondary Highways
0 500 1,000 1,500 Feet

LAND SUBDIVISION SHOWING REALTORS AND ENGINEERS HOW TO TAKE ADVANTAGE OF EXISTING CONDITIONS

Separate ownerships must be considered if the planner expects to succeed within a reasonable time. Note the method of boulevarding the creek, thus preserving the stormwater drainage system.

of the highway section, one setting the framework, the other the pattern.

The holding of numerous public hearings as the plan is being evolved is essential. These hearings give the public an opportunity to express their views and to inform themselves as to the intent of the plan. They are so conducted as to cause the people to realize that the plan belongs to them and that responsibility for its adoption and execution is likewise theirs.



TEN-YEAR PROGRAM OF GRADE-CROSSING SEPARATIONS FOR SAN GABRIEL VALLEY

The county was divided into six sections for grade-crossing studies. Of these San Gabriel is one section. Note the large number of crossings to be abandoned (about 240) and the comparatively small number (24) of separations called for in each ten-year program. All crossings are to be separated alternately. Only 60 new ones are added when the highway system is fully developed. Most of these are in the sparsely inhabited areas. In the whole county, 1,250 crossings will be abandoned.

The commission, at its regular bi-weekly meetings, in determining general policies receives delegations of citizens and considers various matters on appeal.

Co-ordination—Co-ordinating the work of planning with official, semi-official and other agencies is vital in executing the plan. The commission was instrumental in forming a body of engineers called the City and County Engineers' Association of California. This association meets once a month. It was founded July 13, 1923, "for the purpose of acting as a body of advisory engineers for the regional planning commission."

Formed also under the direction of the commission in December, 1924, is an organization known as the Association of City Planners of Los Angeles County, with a membership of 900, composed of members of city planning commissions, city councilmen, city engineers, city attorneys and others interested in planning work. This organization meets once a month, each time in a different community. It unites more closely all the varied groups engaged in planning and serves as a reservoir of information constantly drawn upon by the various cities. A member of the commission's staff serves as executive secretary in each of these organizations.

In southern California nearly all the detail work of co-ordination in progress and development enterprises is accomplished through committees. Because of the nature of its work the commission's staff is frequently called upon by the various agencies to act on these committees. Thus, in arriving at their deductions and conclusions, they have first-hand information as to the latest developments of the commission's work. The commission is represented in the League of California Municipalities, the Los Angeles County Grade-Crossings Committee, the Los Angeles City Planning Association, the Industrial Trackage Committee of Los Angeles County and the Chamber of Commerce committee on airports and aviation.

The commission is also in constant contact with the county surveyor, the county road department, the Los Angeles Major Traffic Commission, the State Railroad Commission, the Greater Harbor Committee of 200, the Citizens' Committee on Parks, Playgrounds and Beaches, the Automobile Club of Southern California, the Los Angeles Realty Board, the Los Angeles County Flood-Control District, the Los Angeles County Sanitation District and the Associated Chambers of Commerce. It finds that its co-operation with these organizations, together with its representation upon other committees, greatly fortifies the work of planning. This is demonstrated by the whole-hearted support given by these various bodies, who find in the planning done by the county a reliable basis for their own developments. In the county administration itself matters pertaining to planning and engineering are discussed by a committee composed of the engineering heads of the departments in order to co-ordinate the work of planning with that of surveying, finance and construction.

Engineering Application—All phases of planning work must have an engineering application. Therefore extreme care is exercised to carry each part of the plan to a degree of completeness that will permit it to be applied by the legal, surveying and construction divisions. The plan, or any part of it, is complete only when it

satisfies all the conditions prescribed in the master plan outline. It must include sufficient information to enable each division or department to put it into execution with ease and precision, at the same time without transgressing upon the policies or duplicating the work of another department. The value of making planning procedure conform to the engineer's methods and thought is strongly accentuated in the contacts with the various official and semi-official bodies. It has brought full and prompt recognition of the work of the Los Angeles County Regional Planning Commission because the engineering practices are thus more readily understood.

The process of planning is the only method thus far discovered that assures the development of the region so that its parts will relate properly to one another and be connected by adequate provision for circulation, communication and orderly growth, so that the whole will reflect the intelligence and culture of those who live in it.

Charles H. Diggs is director and the writer is chief engineer of the Los Angeles County Regional Planning Commission, a body of five appointed members serving without pay and three members ex-officio—the director, the county surveyor and the county road commissioner. Section heads are as follows: C. B. Gillam, highway engineer; J. A. Mellon, subdivision engineer; A. E. Williamson, zoning engineer; W. F. O. Ruchti, landscape architect, and Bryant Hall, research engineer.

Treated Timber in Dock and Bridge Construction

Wide Use of Creosoted Piles and Timber in Railway and Highway Structures—Fire Hazards on Timber Docks

TWO papers on the use of creosoted Douglas fir piles and timbers for dock, trestle and truss bridge construction in the Western states and in Canada, presented at the annual meeting of the American Wood Preservers Association, give useful information as to the practical and economic aspects of this type of construction. The use of creosoted Douglas fir piles and timber in dock and bridge work on the Chicago, Milwaukee, St. Paul & Pacific Railway was described by R. J. Middleton, assistant chief engineer, and the use of similar preframed material for highway truss bridges was dealt with by P. E. Philip, deputy minister and chief engineer of the Department of Public Works in British Columbia. Abstracts of these papers are given below.

Railroad Dock and Bridge Work—We have found it impossible to forecast even approximately the life of untreated piling or timber in Puget Sound waters. In some extreme cases the life has been quite short. Our experience indicates that the creosoted timber better resists the attack of the *Limnoria* than of the *Bankia*, as the work of the former has been confined largely to untreated timber or treated timber where the creosoted shell has been broken either because of driftwood chafing, *Bankia* borings, or inadequate field creosoting of bolt holes. It is therefore quite general to resort to some means of preservation for piles and timbers used in permanent or semi-permanent waterfront structures. Numerous methods to prolong the life of piling include copper sheathing, concrete incasement, guniting, burlap covering and creosoting, this last being the most general method.

In one of our docks we have few if any of the creosoted piles driven twenty years ago, while in others 70 and 78 per cent are still in use. The outer end of one dock has fully 96 per cent in place after sixteen years' use, and another has 100 per cent after twelve years' service. In addition to piling in docks, we are using creosoted piling in minor structures such as trestles exposed to salt water, small lumber docks, gridirons, dolphins and transfer bridges. The last named consist of a pile approach, a bridge seat, a 75-ft. steel and timber apron and a gallows frame. All piles, including those in fender and fender dolphins, are creosoted. The timber in the original bridges was untreated fir, but we are renewing with preframed creosoted fir the apron truss chords, floorbeams, rail stringers, hanger truss and all bracing subjected to salt water.

Fire Hazard Troubles Dock Owners

In creosoted dock construction there is a fire hazard which gives dock owners no little concern. A few years ago a dock in Seattle supported on creosoted piles was destroyed by fire, which apparently originated underneath the dock and because of its rapidity was soon out of control. A similar fire occurred in Seattle in July, 1929. The latter structure was supported on creosoted piles with creosoted caps and stringers. The fire apparently originated under the floor at the outer end of the dock and in an amazingly short time it traveled underneath the floor of the entire length and breadth of the building, charring the caps, stringers, underside of floor and the piling down to the water line, and burning holes through transverse draft curtains, about 100 ft. apart, under the dock.

The interior of the structure was preserved by a sprinkler system, but it was very difficult to fight the fire where it attacked the unprotected portions outside the warehouse, because of the intense heat and dense smoke of the burning gases generated. It seems desirable to devise some means of extinguishing the fire at its origin or of preventing the spread of gases generated and thus confine the fire to a limited area.

In 1908 we began the use of creosoted timber in bridge work west of the Missouri River. We erected several deck-girder bridges in Montana having a creosoted yellow-pine deck to support the ballast. These timbers after twenty-one years are still in service. Of 35 creosoted Douglas fir pile and timber trestles with ballast deck, built in 1915 to 1918, there are nineteen located east of the Cascade Mountains in a comparatively dry climate having an average rainfall of less than 10 in. per annum and in a territory where there is a variation of 100 to 120 deg. in temperature. The others are between Seattle and Tacoma, where the average humidity is high and annual rainfall approximately 33 in. and where there are no great extremes in temperature.

The material was seasoned by the boiling process and given a full-cell treatment with a minimum absorption of 12 lb. per cubic foot. No incising was done. Specifications called for 1-in. penetration in piles and timbers and ¾-in. for planks. Rough timber was used, with no preframing except at bearing points of stringers. Boring tests in 1929 on bridges east of the mountains showed no signs of decay in piling or timbers after eleven to fourteen years' service. Horizontal checks are appearing in a few stringers and an occasional pile has split at the top and requires bolting. On the structures between

Seattle and Tacoma only one pile was found that needed bolting.

During 1928 and 1929 there were 39 creosoted pile and timber trestles built, with ballasted decks, and we have a large number on our schedule for this year. Rough material of the desired grade is shipped to the creosoting plant, where it is sized, bored and cut to length. All preframed material is marked for the assistance of the field forces. With preboring of caps and stringers, careful driving of piles is required and sometimes a slight expense for jacking piles into position, but the added protection due to treatment after boring justifies this procedure. All timber cut in the field receives three coats of hot creosote and all holes bored are swabbed for full length with three coats by a special round brush. Any holes not used are filled with wood plugs soaked in hot creosote. The tops of all piles are treated with two coats of hot creosote and two of hot bituminous mop coating, with two layers of saturated felt between them. All these structures are designed for Cooper's E-60 loading.

Practice in British Columbia

Fraser River Timber Truss Bridge—The government of British Columbia has control of 18,000 miles of roads with 4,800 bridges of all kinds. To replace major structures on main highways, concrete and steel structures are adopted. Small timber trestles are being replaced by culverts and fills. The structures between these two classes present the major problems in renewal. An untreated timber structure will last not more than fifteen years, but the life expectancy of timber truss spans can be increased to 30 years by the preframing and preservative treatment of the truss members, while the treating increases the cost of the completed span only about 12 per cent.

These conditions were taken into consideration by the Department of Public Works in the design of the bridge over the Fraser River at Quesnel, B. C., to replace a ferry. This bridge consists of five through Howe-truss spans, three of 180 ft. and two shore spans of 150 ft. Timber construction presented the cheapest solution, and it was decided to creosote all truss members by the pressure process. The same designs as for untreated timber spans were used. Timber was cut at a Vancouver sawmill and taken by scow to the creosoting plant in North Vancouver, where a framing yard was provided, with all facilities for handling the timber and with air for boring operations. The timber was delivered fresh from the saw, but before it was framed considerable sun drying had taken place, causing "seasoning checks." All timber was framed prior to treatment and was handled with care at all times. Use of peavies, hooks or other tools in a way to bruise or puncture the timber was not tolerated.

The vital points in all framed structures are at the framed joints. It is at these points that the net sections are lowest, the unit stresses highest and the conditions promoting decay at their worst. It needs no argument, therefore, to convince any reasonable man of the folly of cutting away the protective skin which has cost money to treat. To do so is to leave the strategic points of defence wide open, unguarded to the enemy. This cannot be too strongly emphasized. It is hardly necessary to state that great care was taken in framing these spans, as reframing cuts away the protective skin to some extent. The treatment given was the 8-lb. empty-cell, boiling-vacuum, pressure-creosoting process.

After the timber was treated it was shipped to Quesnel, 450 miles north of Vancouver, and was closely reinspected prior to erection, particularly as to warping and checking. The chord members are built up of three pieces spaced 2½ in. apart by metal keys and clamps. Crosswise of the chords are the numerous bolts, spools and washers. Excessive warping would make reassembly of chords very difficult, but there was no real trouble with this. Some of the crossgrained timber was warped a little and a few sticks had surface bends, but on the whole the timber went together quite freely, and the result was a satisfactory framing operation without recourse to any further sizing. Longitudinal checking lying in the plane of the bottom of daps for clamps which are in tension in the structure would be serious, but there was practically none of this and the checking generally was less than expected. One stick was badly crossgrained and should not have passed inspection at the sawmill. This opened up badly and had to be replaced. A failure such as this is costly, for the reason that to introduce a new stick into a chord the whole chord has to be reassembled.

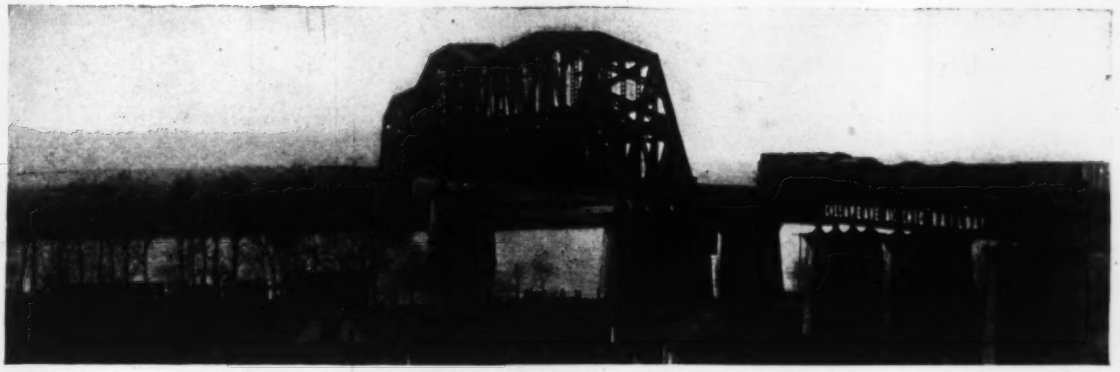
Several borings were made, some specially and others necessitated on account of bolt holes having been missed or being wrongly placed, and the penetration was found to be light on the sides of sticks and perpendicular to grain; but at all the vital framed connections, wherever end grain was exposed, as in framed joints, the penetration was very good. Daps, gains, end cuts and bolt holes everywhere promoted a deep penetration. The significance of this was only fully realized during erection.

To prevent water getting down into the checks in the chord members they were all covered with sheet metal, the same as in untreated spans. In the future a bituminous felt will be used for this purpose. It is expected that the structure will last twenty years at least. It should serve all the real needs of the district for that period, will not be expensive to repair and presents a good appearance.

In this connection we are revising our designs of Howe-truss spans, reverting to the old mill-type truss with close-packed, laminated chord members, on the reasonable assumption that we can get preservative treatments that will extract the moisture from and thoroughly sterilize the timber. The injection of preservative and the covering of the chords with sheet metal or other covering to keep moisture from getting down into checks and spaces between leaves should then hold off the destructive agencies for a long time. In other words, if we can extract the natural sap and moisture down to low limits, sterilize the timber thoroughly and prevent the inception of rot, we can safely abandon the open-chord construction and revert to the solid laminated chord. An obvious advantage is that the most expensive part of the ironwork is dispensed with and the saving thus made is sufficient to pay for the treatment.

Toll Road From Turin to Milan

A 78-mile toll road from Turin to Milan, Italy, is to be built by a private corporation at an estimated cost of $7,627,000. Of this amount $1,052,000 will be given outright to the corporation building the road by the provinces, communes and corporated cities which will be benefited. The Italian government will advance $2,453,790, which will be paid in 50 annual installments. The balance of the funds necessary is to be secured through the sale of interest-bearing securities.



Ohio River Bridge on Chesapeake & Ohio Railway (Chesapeake & Hocking Extension)

Improvements Effect Economies on the C.&O. Ry.

Eight-Year Intensive Program for Improving Road and Equipment Results in Marked Economy and Efficiency of Operation With Increasing Traffic—Operating Ratio Reduced From 88 to 66 Per Cent—New Bridges and Terminals—395 Miles of 130-Lb. Rail

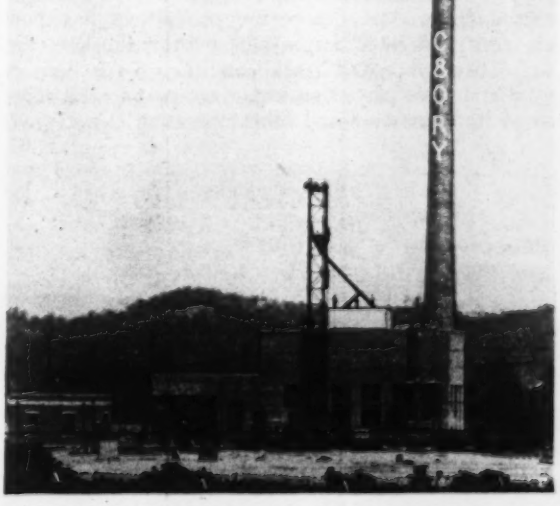
By R. N. Begien
Vice-President, Chesapeake & Ohio Railway

The vast and varied improvement works now being carried out by the large railroad systems, and the economic results which follow and justify the expenditures for these improvements are well illustrated in the following article relating to the Chesapeake & Ohio Railway. It is a fitting companion to two previous articles on the Western trunk lines and the Pere Marquette Railway, published in *Engineering News-Record* of May 30 and Oct. 24, 1929. All three articles dwell on the extensive engineering improvements and their effects upon the economy and efficiency of railroad operation. —Editor.

THE beneficial effect on operating cost and earning capacity which results from providing proper facilities and maintaining at a high standard the physical property of railroads has been clearly demonstrated in the performance of the Chesapeake & Ohio Railway during the past six or eight years. The railway management, foreseeing greater traffic possibilities, together with the need of improved and additional facilities to handle this traffic and to provide the service the business warranted, and having assurance that the financing of capital expenditures for necessary and justified improvements could be arranged, proceeded to make a careful study of the necessities and justification for a program of improvement.

Beginning about 1920 and made effective in 1922, this railroad entered into a rather intensive, well-organized and planned program of improvements to be spread over a period of years. Additional facilities and improvements in maintenance-of-way and maintenance-of-equipment were planned and budgeted, to be provided as the growth of traffic and operating conditions required them. During this period of expansion of traffic and improvements, business conditions throughout the country underwent a decided change. Faster and more dependable movement of merchandise caused reduction in stocks of various commodities. Merchants and users of material began buying their supplies as needed, and depended on prompt delivery by the railroads. This condition made it all the more necessary for the railroads to continue to improve their performance. A steady and heavy increase in traffic on the Chesapeake & Ohio made it more difficult to carry on its improvement program and at the same time to handle the increased traffic without interruption. These problems were met, however, and scheduling of work was adjusted to meet the requirements, with the result that there has been a continued improvement in the movement of business and the class of service rendered throughout the period of improvement.

This improvement program began with a reorganization and strengthening of the maintenance-of-way and maintenance-of-equipment departments. Annual requirements for expenditures for labor and materials were carefully worked out in advance and the year's work was budgeted and scheduled. Fluctuations in business and earnings during the year were not allowed to interfere with the monthly schedule of expenditures. In addi-



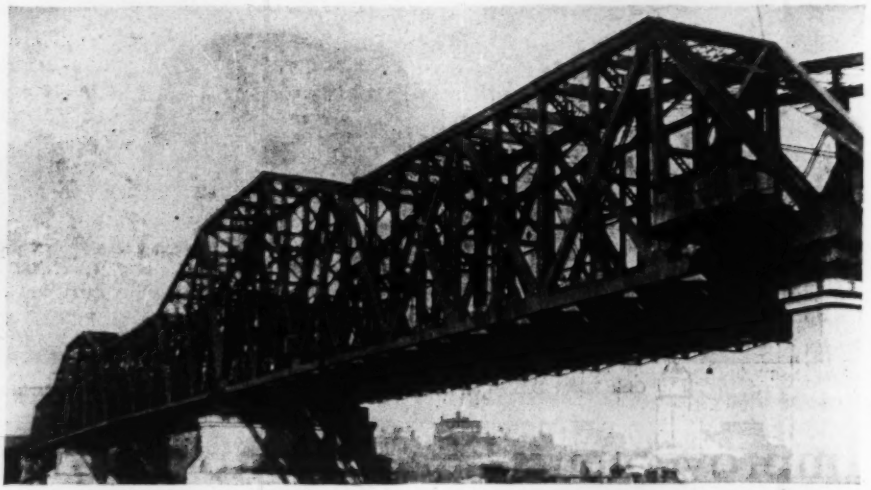
POWER HOUSE FOR CAR SHOPS AND YARDS AT RUSSELL, KY.

tion, the department handling materials and supplies was reorganized and provision made to furnish the using departments with materials as needed. These using departments, finding that they could depend upon deliveries according to schedule, reduced their stocks and thus eliminated the expense and waste of carrying surplus material.

Track and Maintenance-of-Way—A system of cost accounting was put into effect in the maintenance-of-way department. Knowledge of unit cost of applying materials and performing the various maintenance operations obtained by time studies permitted more accurate estimates of expenditures required and more accurate scheduling of work. Comparison of performances as among various forces and districts resulted in competition and increased efficiency. This resulted in raising the standard of maintenance materially and a reduction in cost per 1,000 gross ton-miles of freight (excluding locomotive and tender) from 51.04c. to 46.72c.

Improvement in maintenance conditions involved improving drainage, strengthening roadbed, cleaning and increasing the depth of ballast, using creosoted cross, switch and bridge ties, increasing weight of rail, strengthening bridges and securing better line and surface of track. Rail of 130-lb. section was substituted for 90- and 100-lb. rail on heavy-traffic main lines, and 100-lb. rail for lighter sections on heavy-traffic branch lines. Thus the mileage of 130-lb. rail in first main track was increased from 90 miles in 1923 to 318 miles in 1928, and the 100-lb. rail from 847 miles to 1,130 miles. Ballast sections were increased and the percentage of creosoted ties in track brought up to about 75 per cent, the use of creosoted ties having been started in 1917. Steam ditchers and air-operated spreaders were used extensively in improving drainage and roadbed.

Annual track inspections, made with an inspection car equipped with automatic recording devices, checked by personal observation of inspecting committees, has shown each year a decided improvement over the preceding year. These improved track conditions have been reflected and have played an important part in the reduction of transportation and other operating expenses, resulting in a steady decrease in operating ratio from 88.2 per cent in 1920 to 66.1 per cent in 1928.



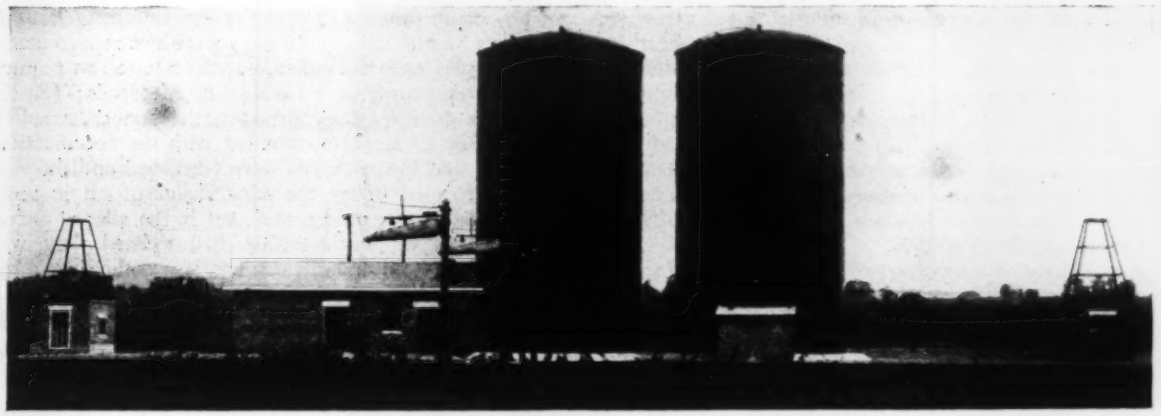
NEW OHIO RIVER BRIDGE AT CINCINNATI; CHESAPEAKE & OHIO RAILWAY
Old bridge alongside at right.

In the reorganization of both the maintenance-of-way and maintenance-of-equipment departments, ample supervision was provided and the supervisory officers were carefully selected. Necessity for full co-operation of all departments was fully recognized and effected. This was particularly applicable to the relations between the using departments and the stores and purchasing department, and between the transportation department and the maintenance and construction departments. The effect of this co-operation was very apparent and was reflected in the absence of conflict in the conduct of maintenance and construction work and the regular and uninterrupted movement of traffic.

Increased Facilities—Besides the effect of the improvement of existing facilities upon operating cost and efficiency, the addition of facilities required for handling the existing and increased traffic with greater efficiency has also shown full justification in operating savings and quicker and more dependable movement. Among the major additions to facilities during the period of improvement and now under way are the following:

New bridges over the Ohio River at Cincinnati, Ohio, and Limeville, Ky. Construction of Chesapeake & Hocking Railway from Waverly to Columbus, Ohio, 63 miles of heavy double-track line with light curvature and maximum grade of 0.2 per cent against loaded traffic. Grade separation through Covington, Ky., to new Ohio River bridge. Extensive work at Ashland, Ky., involving

STATION AND TRACK ELEVATION AT COVINGTON, KY.; CHESAPE..KE & OHIO RAILWAY



STANDARD WATER STATION AND TREATMENT PLANT

relocation of freight tracks, moving them from the center of the city to a location near the river. Strengthening bridges on the Greenbrier subdivision to carry the heaviest motive power. Third track between Barboursville, W. Va., and Riverton, Ky., 37 miles, with a fourth running track through Huntington, W. Va., and Ashland, Ky. New eastbound hump yard at Clifton Forge, Va., involving extensive line revision and extension of westbound yard. Extension of sidetracks on the James River or low-grade freight line. Grade revision at Covington, Va. Locomotive repair shop at Huntington, W. Va., and car shop at Russell, Ky. Additional yard tracks at Newport News, Va., the eastern tidewater terminal. Engine terminal and yard facilities at Fulton, Va., Hinton, W. Va., Russell, Ky., and Stevens, Ky. Additional yard and engine facilities at Parsons, Ohio, the northern terminal of the Chesapeake & Ohio Railway and junction with the Hocking Valley Railway.

These improvements involved 6.5 miles of grade revision, 168 miles of additional second track, 13.6 miles of third track, 5 miles of fourth track, 8 new or improved roundhouses, 13 modern turntables, 52 improved water stations and water-treating plants, 13 coaling stations, 9 new and 49 improved passenger and freight stations, 15 grade-crossing eliminations and 61 miles of automatic train control. In addition, there were numerous new sidetracks and extensions of existing sidetracks, additional signals and interlocking and other miscellaneous improvements.

COMPARISON OF OPERATING DEVELOPMENTS ON THE CHESAPEAKE & OHIO RAILWAY, 1923 AND 1928

	1923	1928	Per Cent Increase or Decrease
Miles of road operated	2,553	2,724	6.70
Freight train-miles	10,934,471	13,278,416*	21.44
Locomotive-miles	12,259,809	14,854,879*	21.17
Gross ton-miles, excluding locomotive and tender (thousands)	25,170,486	35,993,243*	43.00
Net ton-miles, revenue and non-revenue (thousands)	13,740,794	19,295,908*	40.43
Total tons of revenue freight carried	47,949,494	65,935,659‡	37.51
Tons of revenue coal carried	34,860,453	53,494,335‡	53.45
Equipment rents, net	$2,155,899	$3,576,370†	65.89
Passenger train-miles	5,534,579	5,532,691	—0.02
Net ton-miles per car-day (all cars on line)	860	1,284*	49.30
Gross tons per train, excluding locomotive and tender	2,302	2,711	17.76
Train-miles per train-hour	9.0	12.4	37.78
Gross ton-miles per train-hour, excluding locomotive and tender	20,651	33,566	62.54
Car-miles per car-day (all cars on line)	34.7	52.7*	51.87
Net tons of coal consumed, freight	1,811,637	1,835,918	13.40
Coal per 1,000 gross ton-miles, including locomotive and tender	129	92	—28.68
Average number freight cars on line daily, all cars	43,794	41,075	—6.20
Average number freight cars on line daily to handle 1928 business, based on 1923 performance		61,304	
Average number freight car-days saved daily		20,229	
Train expense, passenger, per train-mile	$0.6040	$0.5280	—12.58
Train expense, freight, per 1,000 gross ton-miles	0.5780	0.3750	—35.12
Yard expense, per 1,000 gross ton-miles	0.2682	0.1805	—32.69
Savings in 1928 based on applying 1923 unit costs to 1928 business and equating for decreased cost of fuel per ton			$7,317,950
Saving in car-days effected by increasing net ton-miles per car per day from 860 to 1,284			7,403,650
Total saving			$14,721,600

*Exceeded in 1926. †Exceeded in 1925. ‡Exceeded in 1927.

In addition, there were numerous new sidetracks and extensions of existing sidetracks, additional signals and interlocking and other miscellaneous improvements.

Improvement in water supply and water-supply facilities has been one of the outstanding projects which has shown full justification for the expenditures. At the beginning of the improvement period there were fourteen water-treating plants. This number has now been increased to 46, and approximately all of the water requiring treatment, or about 55 per cent of the total used, is being treated. The effect of the use of treated water in reduction of expense, in locomotive maintenance and in improved operation has fully justified the expense of installation and operation of these plants.

Operating Results—From the end of 1921 to the end of 1928 investment in road and equipment had increased $72,393,151. Improvements and additions to road and equipment, involving increased capital expenditure of approximately $30,296,105, are now in progress. The following outstanding features in improved operating conditions during the improvement period on the Chesapeake & Ohio show conclusively the justification of the improvements and the benefits which may be secured by providing proper and adequate facilities.

The record movement in car-miles per day, including bad order and stored cars, was 41.9 miles in 1923. This had increased to 61.4 miles in 1928. The average daily movement per car in 1923 was 34.7 miles; in 1928 it was 52.7 miles. The number of car-days saved in handling 1928 business, based on 1923 operation, aggregates 6,055,691. In August, 1920, the peak month of that year, the number of cars loaded and moved from 510 active coal mines was 58,961. In October, 1928, there were 327 active mines and the loading was 112,758 cars, an increase of 99 per cent. The saving in train and engine expense, based on applying 1923 unit costs to 1928 business and equating for decreased cost of fuel per ton, was $7,317,950. The saving in car-days and increase in net ton-miles per car-day from 960 in 1923 to 1,284 in 1928 represents a further saving of $7,403,650, or a total of $14,721,600.

In the $72,393,151 increase in investment in road and equipment are included acquisition of branch lines, additional equipment and improvements required for handling the increased traffic, as well as the improvements

provided for the purpose of effecting economies in operation. It would be difficult to separate the expenditures as between the amount invested for handling additional traffic and the amount expended for more economical operation. At least 50 per cent of the total increase in investment was for expansion and handling additional traffic. Therefore the saving of approximately $15,000,000 represents a return of more than 40 per cent on that portion of the investment made for the purpose of securing economies in operation.

A statement of operation and financial results for 1928 compared with 1923, as given in the accompanying table, is some measure of the benefits secured by improving the physical condition of the property and providing facilities to handle the business.

Court Finds Owner Liable in Suit Over Building Contract

A COURT decision recently handed down in San Francisco in a suit brought by a contractor to recover damages from the owner of a building being erected by the plaintiff clearly brought out the responsibilities that rest upon the owner, and in this case ordered the owner to compensate the contractor not only for all expenditures plus interest but also for anticipated profits on that part of the work not yet done at the time the contract was held to be terminated by the act of the owner.

The suit was filed by Monson Bros., contractors, against Martha W. Fischer, owner; was tried in Department 2 of the San Francisco City and County Superior Court before Judge Parker, and had to do with a four-story concrete factory building at Tenth and Howard Sts., San Francisco. Decision was handed down Dec. 11.

After the work on the building was begun under contract between owner and contractor, a third party entered in the form of the lessee, who, with the knowledge of all concerned, employed a firm of inspecting engineers to perform the duties of inspector and to test the concrete as the work progressed. The inspecting engineers participated in determining the mix, checked results and on occasion caused the contractor to make certain changes in the mix, which the contractor did.

After the work had proceeded to the first-floor level, including foundations, retaining walls, building walls, columns, etc., the contractors were ordered to stop work and to remove all parts of the structure then built because the concrete, it was alleged, failed to meet the specifications. The specifications were loosely drawn in that they not only named the proportions of concrete materials and also required a certain strength but the strength was specified without naming any particular age of the concrete at which the specified strength was to be attained.

The contractor, believing the concrete to be better than it was rated by the firm of inspecting engineers, requested that the matter be arbitrated by competent engineers. This the owner refused to do, the work was taken out of the contractor's hands, a considerable portion of the completed work was demolished, and the building was thereafter finished by another contractor. It was at this point that the contractor filed suit for damages.

Judge Parker's decision is lengthly and sweeping, devoting much space to the finding of facts which, the decision holds, clearly support the plaintiff's arguments. The facts, as found by the court, constitute so complete a basis for findings that the court found it necessary to use only very brief space for the opinion.

The court found (1) that the concrete tests made by the firm of inspecting engineers were not representative and samples were not taken, cured or tested as required by the American Society for Testing Materials; (2) that the work done by the contractor, the materials and the concrete in all respects complied with the specifications, and (3) that the materials were furnished and the work was performed under the supervision of an inspector recognized by the owner, and that if the alleged defects in materials or workmanship had existed they were nevertheless open and obvious and it was the duty of the defendant's architect or inspector promptly to call attention to the defects during the progress of the work, and failing to do so and allowing the work to proceed without objection, the owner cannot afterward complain.

As the owner refused to allow the work to proceed unless the contractor should first tear out and remove all of the concrete, it was held that he thereby prevented performance of the contract and became liable to the contractor for the value of the work performed and for the amount of anticipated profit.

Civil Engineering Defined for Registration Purposes

FOR the purposes of the administration of the act passed by the last California Legislature to regulate the practice of civil engineering in that state *(Engineering News-Record,* July 4, 1929, p. 30) the State Board of Registration for Civil Engineers, created in conformity with the provisions of the act, has defined civil engineering as "that branch of professional engineering which deals with the economics of, the use and design of materials of construction and the determination of their physical qualities; the supervision of the construction of engineering structures; and the investigation of the laws, phenomena and forces of nature; in connection with fixed works for: irrigation, drainage, water power, water supply, flood control, inland waterways, harbors, municipal improvements, railroads, highways, tunnels, airports and airways, purification of water, sewerage, refuse disposal, foundations, framed and homogeneous structures, bridges, and buildings. Furthermore, it includes city and regional planning, valuations and appraisals, and surveying, other than land surveying as defined in the General Laws of California, Chap. 247, Statutes of 1907."

The board is now engaged in making a comprehensive study of the procedure and practice in the 25 other states in this country and the seven provinces of Canada which have laws regulating the practice of engineering. Because of the fact that the act provides that graduation from a school or college approved by the board may be considered as an equavalent to four years of practice, the board is also making a survey of the various engineering colleges, universities and technical schools of the country.

The board consists of three members appointed by Governor Young. At an organization meeting held in Sacramento on Oct. 28, the following officers were elected for the year ending June 30, 1930: president, Donald M. Baker, consulting engineer, and president of the Los Angeles board of city planning commissioners; vice-president, H. J. Brunnier, consulting structural and designing engineer of San Francisco, and president of the California Automobile Association; secretary, Albert Givan, chief engineer and general manager of the Sacramento Utilities District.

Depreciation of Railroad Property

A Discussion of Two Methods of Computing Depreciation Considered Applicable to Railroad Property, in View of the Variety of Elements Making Up Such Property

By J. P. Snow
Consulting Engineer, Boston, Mass.

WHAT constitutes a proper method of computing the depreciation upon the property of public utilities is a question which has been brought sharply to the fore by the recent Supreme Court decision in the Baltimore street-railway rate case. In that decision the court stated that depreciation should be computed upon the cost of renewal rather than upon the original cost of the items. Justices Brandeis, Holmes and Stone dissented from this decision. I venture to predict that some day the court will reverse itself in this matter. The dissenters gave extended reasons for their position, but they missed the fundamental principle which, in my opinion, influenced them subconsciously. It is this: *A public utility should not be allowed to pay for additions to its facilities from earnings.*

The question of how to allow for depreciation also has been the subject of an extended controversy between the Interstate Commerce Commission and the executives of the railroads of the country. Consideration of the very valuable report on the subject prepared by Commissioner J. B. Eastman and the contentions put forward by the railroad executives indicates to my mind that the essential difference in the effects of the application of different methods of handling depreciation on valuation, at least, are not clearly understood by many of the parties concerned.

Depreciation Accounting—The report of the special committee of the American Society of Civil Engineers on the formulation of principles and methods for the valuation of railroad properties and other public utilities published in *Transactions*, Vol. 81, December, 1917, p. 1311, explains several methods of depreciation accounting (see p. 1448). Among these are the replacement method and the straight-line method, which are the ones I wish to discuss as applicable to railroads.

Depreciation relates only to decrease of service life. It does not cover routine repairs nor deferred maintenance, although the latter may act to shorten the assumed life period, in which case the annual allowance must be increased.

The replacement method, called the retirement method by Mr. Eastman in his report, is not usually called an accounting method inasmuch as it requires only the permanent record of the cost of renewal at each replacement. The method can be used properly only when an aliquot part of a given group of similar items of property, the part to correspond with the assumed number of years of service life, can be renewed each year. The word replacement is used here largely in a conventional sense. It does not mean that operating expense shall be charged with the cost of the replacement, whatever its cost may be, but that the original cost of the item replaced shall be so charged and the difference plus or minus added to capital account.

The straight-line method, while not the best of the accounting methods for properties consisting of a few units of very large size and long life, is the best for railroad properties consisting of a great variety of items, having all sorts of values and life spans. It calls for setting aside, in the reserve for depreciation each year, an aliquot part of the cost of the item as depreciation allowance, such that the sum of these allowances at the end of the life term will equal the original cost.

Other methods of depreciation accounting like the compound interest, or the sinking fund method, which do not require the setting aside of a constant aliquot part of cost each year, may be preferable in cases of a single large unit of property, but for the wide variety of railroad units the straight-line is to be preferred. It is an interesting fact that in all the methods, including replacement, exactly the same sum is reached at the end of the assumed life period if a given rate of interest is used on all expenditures and receipts.

The Replacement Method

In discussing this method the easiest unit of railroad property to visualize that fills the specification given above for this method is the important unit of crossties. Any railroad, however short, will be "in step" to renew an aliquot part of its ties as soon as operation can begin; and it will continue to renew about an equal percentage of them every year. On a line of 1,000 miles, rails and fastenings, fences, wire poles and probably gravel ballasting and surfacing will be renewed in the same constant way. For larger systems other units like wooden buildings, small bridges, etc., can naturally be renewed in the same yearly way; and finally if all lines in the country were merged into one corporation, if proper attention were given to the annual budgets, every item of depreciable property, even large terminal stations, could be renewed by this method, the requirement being that there shall be as many or more similar items in a unit group as there are probable years of service life in an item.

Under this method the proper annual depreciation allowance is put back into the property each year. Taking crossties for our study, if of hemlock, as they may be on a short line, seven years is a fair estimate of their life in a climate where hemlock grows; then one-seventh of the ties will be replaced each year. On a large system using treated ties, with tie plates, the aliquot part will be much smaller. In all cases the loss of service life ranges from 100 per cent in those which must be renewed this year to zero in those now being laid, the average being near 50 per cent. At this point it is well to explain that we must realize that every item of railroad property must be 100 per cent efficient and safe on the day it is removed, but this does not affect depreciation; it is simply the rule that when an item reaches the point where further service might make it less than 100 per cent safe its service is ended.

For the purposes of the regulating authority and for keeping the capital account straight it is necessary to keep record of the cost of these renewals separate from other maintenance expenses. It is not expected that the original cost of the precise ties removed each year will

be identified, but that the renewal cost during a year as far back as the assumed average life be used as the original cost of those being removed. This practice if intelligently followed will keep the capital account straight at all times, even though the cost of renewal rises or falls or if a more expensive class of material is used or the item discarded altogether and even though the exact aliquot part is not renewed each year, if the correct remainder of the new minus the old is added algebraically to capital, the rule being that earnings shall keep the investment good but shall not be used to increase capital.

In property that cannot be renewed by aliquot parts each year, like the terminal station of our short line road, the straight-line accounting method should be used. In this case an aliquot part of its cost (the depreciation allowance) must be set aside in a reserve which shows in the liabilities column of a balance sheet, while the amount itself as cash, or as additions if the cash has been spent for new items, appears in the assets column. The terminal station also stands at cost on the asset side, hence the account so far as this item goes always correctly represents the investment. Under the replacement method this allowance is actually spent in each year renewing the aliquot part. Hence both methods keep the balance sheet equally correct.

Effect on Valuation

The committee of the Am.Soc.C.E. referred to above defines the passage of service life as decretion. Every item of depreciable property is subject to decretion, but under a proper system of replacement renewals it will have no depreciation of valuation—that is to say, the depreciation must not be deducted from cost new in reaching a fair valuation. This is the point I wish to emphasize. The committee says (p. 1326) " . . . the accounts showing that those amounts have been expended in renewals that were necessary to keep the property in normal working condition, and the fact appearing that no expenditure reasonably to be expected could put the property in better than the normal condition in which it is found, and that no unusually large expenditure is presently to be necessary for this purpose. Then, in spite of the fact that there is an existing decretion in its several parts, there should be found no depreciation of valuation." This of course refers to parts of railroad property that can be and are maintained by the replacement method.

In all cases of depreciable property the earnings should cover an annual allowance for depreciation. For those groups carried by the replacement method, like crossties, this annual allowance is put back into the property during the current year, while under the straight-line or other accounting method the corresponding aliquot part of value expressed in terms of money is carried to depreciation reserve or spent for additions. In this latter case, if a valuation is required after a space of time, the allowances will have been held as working capital or spent presumably for additions, either of which is proper. The inventory of valuation will carry the item of property itself at cost when new, less accrued depreciation, and also the cash or the addition paid for with the cash, making, theoretically, the full investment cost of the property.

In the former case the property must be put in the inventory at full cost, because the regular allowances have been put right back in the item of property itself each year instead of into additions as in the other example. The two methods are alike in effect, but they vary in detail. In both, decretion is always present in the property; in the replacement method chronically at near 50 per cent, in the straight-line from zero to 100 per cent, but the depreciation reserve is always at hand with the amount that must be subtracted from cost new when a valuation is demanded. The point to be emphasized is that for property carried by the replacement method there is no depreciation of valuation. In both cases valuation computed as above will theoretically reflect the true investment.

Application to Existing Railroads

United States railroads were old when regulation, as we know it, was ordered. Many items of property had been renewed time and again; additions had been paid for from earnings outright; renewals had muddled along under a crude sort of replacement method, which means, barring the muddle, that valuations should be made without deducting existing depreciation from cost new as shown above. Consideration must be given, when fixing valuations of railroad property, to the fact that renewals of much fixed property had long been made; by a more or less perfect replacement system and deduction of depreciation from cost new adjusted accordingly.

If we could conceive that everything was new and the day when regulation went into effect was the first day of operation of the road, the theoretical scheme of handling depreciation such as is advocated by the Interstate Commerce Commission could properly be asked for; but with 50 to 80 per cent depreciation actually existing as normal condition a rigid application of the scheme does not apply with justice when depreciation is subtracted from value new. What is fair?

In reaching the present status of our railroads many indefensible things have been done; additions made from earnings, vicious building of duplicate lines, overbuilding for private profit, erroneous construction, wasteful management and many other bad steps taken; but it has been the path we have followed to reach the splendid system of rail transportation that we now possess, the very life blood of our business. We must accept it as is; its manner of making cannot be considered.

Proper regulation is designed to prevent the repetition of bad practices in the future. Railroad executives are opposed to adopting an accounting method for handling depreciation of fixed property. Their views should be given consideration as far as possible. A system that will give the regulating authority the needed data for its purposes must be adopted by the executives. Manifestly the replacement method will be the most acceptable to them and it should be allowed wherever it is properly applicable. As shown above, it greatly simplifies valuation, keeps the capital account straight and shows the necessary annual increment to budget for renewals when ratemaking is at bar.

North Carolina Filling Station Law Unconstitutional

Prohibition of the erection of new filling stations within 250 ft. of residence dwellings was held unconstitutional by the Supreme Court of North Carolina in a contest of such an ordinance passed by the city of Fayetteville. Evidence that 23 out of 25 existing filling stations were within the prescribed distance was introduced to show that the ordinance was an unreasonable use of the police powers of the city.

Steel Frames for Houses

Three Articles Analyzing the Problem and Proposing a Course of Procedure That Will Modernize the House-Building Field

By T. J. Foster
Chairman, National Bridge Works, Long Island City, N. Y.

III—The Next Step

Proof that good low-cost construction is possible—Formation of a large purchasing and directing corporation, nation-wide in scope, represented locally by builders and developers—Approach the problem as the merchandising of an esthetic and structurally sound house regardless of exploiting any specific material.

IN THE two preceding articles I have outlined the principal faults of present and past methods of small house construction, with an analysis of the problem as it presents itself to me after eight years of study and experimentation in this field. I have tried to show that the proper utilization of the materials now available requires an unprejudiced approach to an old problem. Substitution of new materials for old does not solve it If we are to utilize these modern materials to the greatest extent we must study them in their relation to one another and to the basic materials which they are intended to replace or with which they must be combined. At the same time we must familiarize ourselves with any new methods of construction that will facilitate their economical use.

It is evident that this must be done not by persons financially interested in certain building materials but by the combined forces of the architect and the engineer. There has been too much conflict between these elements of the housing industry; to realize their highest capabilities, they should work together. When this partnership is a workable fact we may expect to see the average home as superior to that of today as the present office building is superior to the shoddy frame structure that housed industry 25 years ago.

In our approach to the small house problem we almost invariably put the cart before the horse. The usual procedure is to make an attractive exterior the basis from which to work, whereas the first task should be to decide on the number and size of rooms and the arrangement desired, and then to find the materials suitable for the type and approximate cost of the house. The artist's work, of combining the arrangement with the materials of construction to produce the most attractive result, would be the final accomplishment.

The cost of present construction is a prime factor in determining a course of action in connection with new structural problems in the residence field. One set of representative and satisfactorily authoritative figures is submitted by the Quantity Survey Company, of New York City. The costs given are based on the average small house construction for a group of particular houses. Overhead and profit, compensation and liability insurance are not included, because there are no uniform charges for such items. The figures are based only on a section of a floor or wall and do not include the cost of extra framing, since this also varies according to the job. Costs of materials and labor were figured as follows: carpenters, $12 per day; bricklayers, $14 per day; laborers, $9 per day; plasterers, $12 per day; lumber (average) $40 per 1,000 ft.; common brick, $22 per 1,000; wood lath, $10.50 per 1,000; metal lath, $0.23 per square yard; metal lumber and studs, $90 per ton; structural steel, $65 per ton. The costs follow:

For wood floor framing, 3x10-in. joists, 16 in. on centers, bridging, rough floor, wood lath and plaster, the cost is $0.39 per square foot, and $0.03 per square foot must be added if metal lath is used instead of wood.

Metal lumber floor construction, with chairs, bridging, rib lath, 2-in. concrete, wood sleepers and fill, rough floor, metal lath and plaster, costs $0.64 per square foot.

The cost of materials and overhead, including the steel joists, for the floor shown in Fig. 2, with a live load of 40 lb. per square foot and for a joist of 16-ft. span, is $0.40 per square foot of floor. This price finishes the ceiling for decoration and the floor ready for the felt and finished floor.

Stud partitions with sills, plate, bridging, 2x4-in. studs, 16 in. on centers, wood lath and plaster, cost $0.47 per square foot, and $0.06 per square foot must be added if metal lath is used in place of wood. Solid plaster partitions, with steel studs, metal lath, and plaster on both sides, cost $0.42 per square foot.

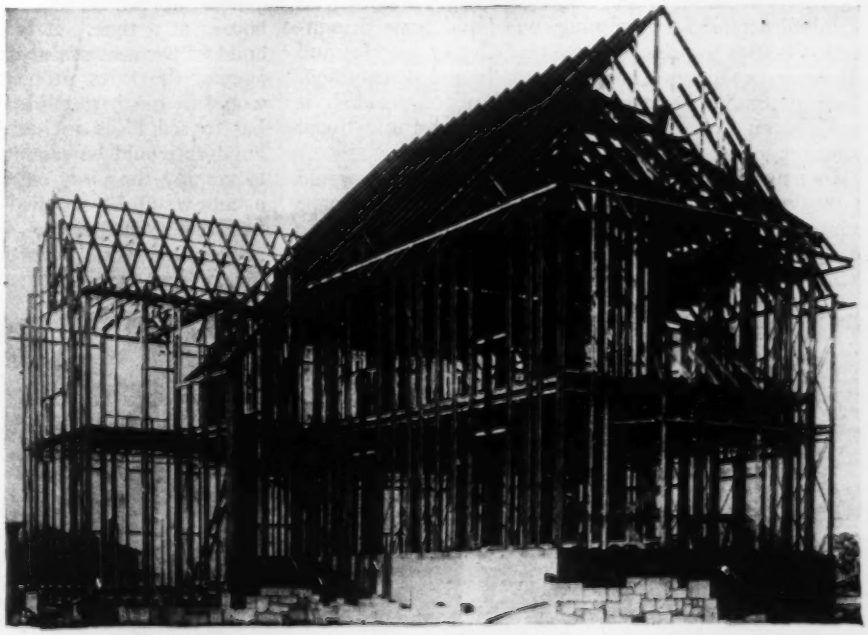


FIG. 1—STEEL-FRAME HOUSE READY FOR INSULATION SLABS AND FACING
Product of Walter Bates Steel Corporation.

A construction using 3-in. gypsum hollow-block partitions and plaster on both sides costs $0.41 per square foot.

Partition slabs, such as are shown in Fig. 3, with plasterboard on both sides, can be made and erected for $0.30 per square foot. With plasterboard on only one side, as would be the case for walls, the cost is $0.22 per square foot.

For wood-frame construction with exterior walls, using sill, plate, bridging, 2x4-in. studs, 16 in. on centers, sheathing, black

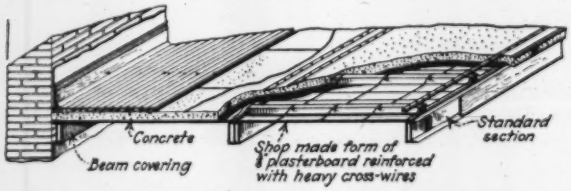


FIG. 2—THIN AND SOUNDPROOF FLOOR DESIGN DEVELOPED BY NATIONAL BRIDGE WORKS

paper, wood lath and plaster, the cost is $0.41 per square foot, and $0.03 per square foot must be added if metal lath is used in place of wood.

For metal lumber construction of walls, using bridging, lath, and stucco, and lath and plaster, the cost is $0.71½ per square foot.

Roof slabs of precast aerated gypsum similar to the partition slabs of Fig. 3 cost $0.18 per square foot, erected, including insurance and overhead. The cost of roof slabs will vary more than that of floor slabs on account of the greater diversity of roof types.

National Organization Needed

Granted that existing materials are to be used, that houses and not materials are to be sold and that we have available from past experience enough new and economical details to make a start on a rejuvenation of the field of residence construction, what is the character of the organization required to carry this out? A basic necessity, in the writer's opinion, is a merchandising plan of national scope. The best things we have today are made and furnished on the quantity scale, and most of them are standardized. Such standardization does not mean that there is a limited variety to choose from—on the contrary, we have a wider choice than ever before—but it does mean that the quality of the supplies are superior and that the price we pay is proportionately small.

The merchandising plan should be initiated by demonstrating its advantages to a small group who will furnish the initial capital for designing, will build some demonstration houses to prove the practicability of the idea and will study production, buying methods and distribution. These preliminary matters satisfactorily concluded, it would be an easy matter to secure capital for national operation.

The activities of such a large-scale corporation would be conducted with the assistance of artists, landscape architects, engineers and construction specialists. Also there would be a research department charged with the task of testing new materials and methods and thus improving the construction each year, with attendant reduction in costs. A tentative organization chart of such a proposed corporation is shown in Fig. 5.

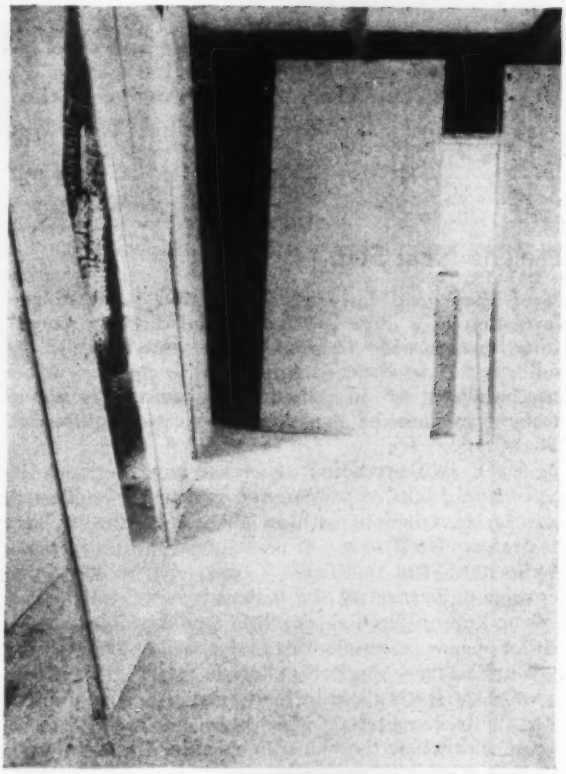


FIG. 3—PARTITION SLABS OF PRECAST GYPSUM ON A NATIONAL BRIDGE WORKS RESIDENCE

It would not be necessary for this corporation to enter the manufacturing field or to do actual construction work. At present the majority of small house building is done by developers who buy tracts of land and build many houses at a time. It is estimated that such developers build 65 per cent of our dwellings. With such persons as agents, the sales problem of the national corporation would be much simplified over an arrangement attempting to sell ideas to individual builders. Only the best builders would be retained, and they would be required to employ the most efficient workmen available. These agents would be supplied with plans, full details, bills of materials, schedules of operation and all supplies. The corporation would ship the materials in proper sequence direct from the point of manufacture to the builder. In-

FIG. 4—INTERIOR VIEWS OF STEEL-FRAME HOUSE IN CLEVELAND, OHIO
Junior beams used on 4-ft. centers by McKay Fireproof Company; ⅜-in. gypsum board for wall insulation.

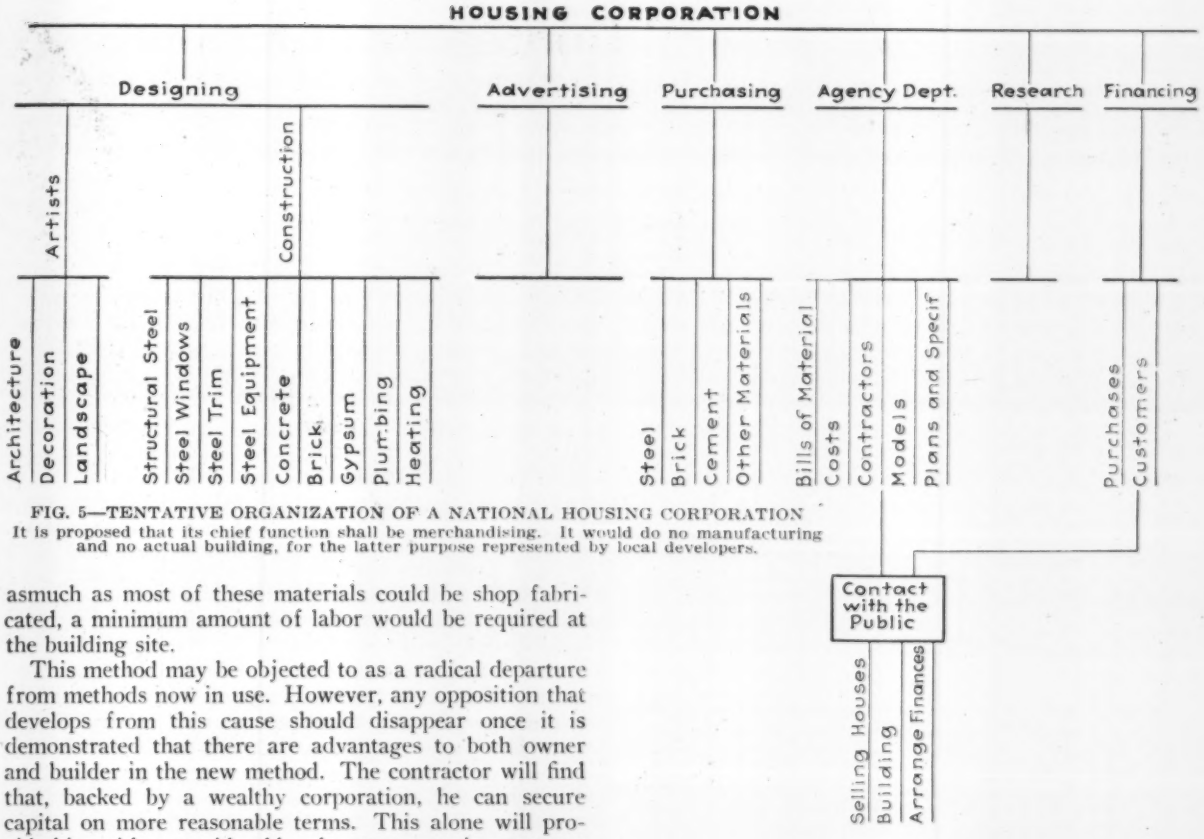


FIG. 5—TENTATIVE ORGANIZATION OF A NATIONAL HOUSING CORPORATION
It is proposed that its chief function shall be merchandising. It would do no manufacturing and no actual building, for the latter purpose represented by local developers.

asmuch as most of these materials could be shop fabricated, a minimum amount of labor would be required at the building site.

This method may be objected to as a radical departure from methods now in use. However, any opposition that develops from this cause should disappear once it is demonstrated that there are advantages to both owner and builder in the new method. The contractor will find that, backed by a wealthy corporation, he can secure capital on more reasonable terms. This alone will provide him with a considerable advantage over incompetent developers, not allied with the corporation. Improved methods of construction and better materials will further increase his advantage, and his reputation for superiority in his field of construction will give him a larger and better clientèle. The owner of the small house will find that he can obtain a well-built and beautiful home for less than he has had to pay heretofore for an ugly, flimsy structure.

FIG. 6—STRUCTURAL IRONWORKERS ARE AVAILABLE FOR RESIDENCE CONSTRUCTION

From the point of view of the investor in such a corporation, the advantage lies in the fact that the greatest amount of money is made in merchandising. Because of quantities used and by reason of direct shipments, materials could be laid down at the building site at a very low price. They could be sold to the user at prices competing with the local cost of materials and still show a profit to the corporation. Designs and service would also be sold.

The desire of the average man for a better house value and the universal hope that present bad conditions will soon be remedied should do much to bring about better values for the builder. The problem is one for the engineer, the architect and the merchandiser, and it is capable of solution if it is attacked as a primary problem by an organization set up for that sole purpose and not as a means of forcing certain materials on the market.

Lug and Lugless Brick Confused in Paving Brick Report

Frank B. Dunn, of the Dunn Wire Cut Lug Brick Company, calls attention to an error in the report on the meeting of the National Paving Brick Manufacturers Association in *Engineering News-Record*, Dec. 12 issue, p. 940. There evidently was a reversal as to types of 2½- and 3-in. brick mentioned by Hal G. Sours as used in the resurfacing work in Summit County. The 2½-in. brick were of the plain wire-cut (lugless) type and the 3-in. brick were of the wire-cut lug type, the 10-ton roller being used on the thicker brick. At the end of the third paragraph on p. 941 the 3-in. brick mentioned were not plain but wire-cut lug brick.

Associated General Contractors Outline Progress and Plans

Association Contacts Increased and Definite Progress Made in Surety Bonding, Plant Rental Schedules, Prequalification of Contractors, Standard Contracts and Credit Practices

IMPROVEMENT in contracting practices and in the affiliations of organized contracting with general business, public-works engineering and professional engineers and architects was recorded in the committee reports presented last week at the annual convention of the Associated General Contractors at New Orleans, La. Brief summary only is possible of outstanding developments. Important details of the convention business meetings are given in the news section.

In preparing the year's developments the general manager pointed out the lessons to contractors of the business conference held by President Hoover following the stock-market deflation in October. Summarizing, he enumerated these lessons as follows:

First, national trade associations are the only medium through which constructive influence on national economic developments can be exerted, and they have definitely established their position in modern business.

Second, construction is now generally recognized as the key industry through which business in general may be stimulated, and it is deserving of sympathetic study by government and other economists.

Third, without a strong, well-financed association general contractors will receive scant consideration from either the government or other industries.

Bureau of Contract Information

During 1929 the long labor of the association to improve surety bonding practices terminated in the creation of the bureau of contract information, financed and largely supported by the companies writing surety bonds. As an affiliated division of the association this bureau is investigating the performance record, reputation and work on hand of every general contractor in the United States. Questionnaires designed to secure the necessary information are being sent to each contractor, and the information received is being verified as rapidly as the questionnaires are returned. Various sources of information, including surety companies, public bodies, engineers, architects, financial houses, manufacturers, distributors and contract-reporting agencies, are giving their co-operation. Verified information concerning any contractor will be made available to owners and others with whom he has business dealings. Although the bureau's work has been in process but a short time, it has received a gratifying return of performance records. The following is a summary of the work up to Jan. 9, 1930.

Performance records and statements of contracts on hand have been received from 1,232 contractors scattered throughout the country. Verification inquiries on these records and statements have been sent to approximately 950 concerns. Verification reports have been received from engineers, architects and public officials with respect to 9,233 construction projects. Verifications received from financial institutions total 2,292, and those from manufacturers and distributors of equipment and materials 7,885. Inquiries to surety companies were started only a short time ago, but 1,650 reports have already been received. The total number of verifications returned is 21,060.

A new schedule of average equipment ownership costs similar to the old A.G.C. rental schedule has recently been developed. It shows for each machine the various items of expense expressed as percentages of capital investment. Accompanying the schedule is a price list of high-grade equipment, from which has been computed the average monthly expense of each item expressed in dollars. In order that the new schedule might have the support of depreciation rates approved by the government, the new rates developed jointly with the Bureau of Internal Revenue have been used in the computations.

Prequalification of Contractors

In 1929 for the first time the subject of prequalification had a prominent place on the convention program of the American Association of State Highway Officials. A number of the A.G.C. staff was present at their meeting in San Antonio and obtained support of this plant from most of the highway departments. One by one these are taking interest in the subject and helping with the necessary educational work in their respective states.

Prequalification bills were introduced last year in Pennsylvania, Oregon, Washington and California. The California bill is the only one that passed, but prospects in the three other states are not discouraging. In those states the bill was vetoed by the governors, who now advise that they were not fully informed on the subject or at least were not opposed to the principle. Lately prequalification has been sustained in Philadelphia by the Court of Common Pleas sitting en banc. This court inquired into the subject thoroughly, and in its decision particularly commended the procedure as being in the public interest and already authorized by provisions in the basic laws.

The number of highway departments prequalifying has increased during the past year and now includes, in addition to the Bureau of Public Roads, the states of Wisconsin, Iowa, California, Kansas, Missouri and Georgia. Also, the number of municipal departments following the procedure has increased. These include cities in California, Oklahoma, Louisiana, Pennsylvania, New York and New Jersey. At least eight municipalities of the latter state, which has statutory authority, have adopted the procedure.

Mechanics' Lien Differences Adjusted

The standard state mechanics' lien act, being drafted by a Department of Commerce committee, upon which the A.G.C. is represented, has not yet been concluded. Divergent views on the giving of notice to owners by prospective lienors have split the committee.

A new draft of the controversial sections has recently been completed, and will be considered at a meeting of the committee in the near future. If an acceptable compromise is reached, the work of the committee will be practically completed. A model act will be released, which all interests in the construction industry can profitably support. It should be noticed particularly that the contro-

versies over the act hinge upon whether a prospective lienor shall be required to give owners notice of intention to hold them liable for payment of unpaid accounts of a contractor. This is a significant part of any mechanics' lien act, and is a point to be watched wherever amendments are before the legislature. The stand of the association has been that owners should have the benefit of this warning and should be liable only for money in their possession after such warning has been received.

Standard Contract Situation

Contact has been maintained with the Interdepartmental Board of Contracts and Adjustments, which recently redrafted the proposed public contract act. A new bill, which was reintroduced in November as H.R. 5568, now contains the essential features for rational awarding and settling of government contracts. Two outstanding points sponsored by the A.G.C. and pertaining to contract awards and to liquidated damages are included. These provisions are contrary to the desires of the comptroller-general, and at the present time it is not possible to say what the outcome of the bill will be.

Distribution of the standard building contract of the American Institute of Architects, which is being pushed by the A.G.C., has totaled about half a million copies during the past year. This form, which carries an arbitration clause, is a safeguard against many inequities of the individually drafted document.

Distribution of the standard engineering contract continues about as heretofore, at some 5,000 copies per year. It serves principally as a model in public construction, but is commonly used by consulting engineers on corporation work.

The municipal form, developed jointly by the A.G.C. and the American Society for Municipal Improvements, is being steadily distributed.

Action to Preserve Contracting Business

Since 1921 the country's annual volume of construction has increased nearly 100 per cent, but the volume of work performed by general contractors has not increased in proportion. This industry has been losing business to other agencies that attempt to perform the function of a general contractor.

Day-labor operations, development of construction departments by public utilities, supplying of materials by public bodies, and other factors are causing the general contractor to lose ground. Millions of dollars' worth of construction which he formerly handled is now performed or managed by someone else. The fact that the contract system is the most economical thus far developed will not necessarily prevent its elimination. Its only defense lies in properly directed activities constantly maintained by local and national organizations.

Since contractors have hardly begun to combat encroachment on their business, it cannot be expected that they see the possibility of influencing the flow of money into construction and of expanding their markets. Yet men from the Department of Commerce have explained this possibility at meetings and have offered to help the industry. Stimulating the demand for construction has long been an activity of associations of the material manufacturers, who have put forth the energy and paid the bill while contractors usually took a free ride.

At the present time there are numerous groups who would join hands with the A.G.C. in creating new markets for the services and products of all. But they will not do so until general contractors display the necessary vision, learn to co-operate with other elements of the industry and put up the money to finance properly their own association.

Such joint activities are the shortest road to relief from numerous competitive ills of the industry which cannot otherwise be cured. For the expenditure of a sum that would assess the individual about the price of one cigar per day, millions of dollars' worth of business can be sent through the general contractor and thence into the other industries.

Improved Credit Practices

The allied construction industries committee, consisting of representatives of the A.G.C. and twelve specialized contractors' associations, has been working since its inception in 1928 to bring about better relationships and practices among the contracting groups. The allied committee is promoting local credit plans and interest in the subject of construction credits. Its efforts and those of the A.G.C. are waking up the entire construction industry to the deplorable state of credit. These efforts have started the development of credit plans in some 50 cities. No single movement in the history of the construction industry has gained such universal support and stirred such widespread interest.

Accident prevention work of the association has been directed along two lines: first, to reduce the number and severity of accidents through educational means; and second, to prevent the enactment of ill-advised legislation in the form of detailed state or municipal codes. Such codes can affect only a small percentage of accidents and are opposed because of their actual retarding effect upon intelligent accident prevention. Their multitude of details cannot be enforced on construction jobs as in manufacturing, and ignorant or willful violations beyond the control of the management are committed by workmen. Under these circumstances the principal results of a fixed code are likely to be extortion of contractors and denial of liability of insurance companies.

Mixer Division Takes Up New Problems

The mixer division of the affiliated bureau has for some time been a growing concern, representing 100 per cent of the paver production and about 98 per cent of the building mixer production. Having solved their principal problems of production, the mixer manufacturers are turning their attention to trade practices and to the economics of distribution. They have had their trade practice conference with the Federal Trade Commission, to which representatives of the association were invited, and have been able to produce a degree of stabilization in their business, which is extremely beneficial to themselves and to contractors.

One of the perplexing problems still facing the division is overproduction of mixers, which is likewise a problem of concern to the contracting industry.

Membership and Future Program

During 1929, 468 new members were added to the association and 313 resigned or were expelled, making the present membership 2,237. Eleven branch and chapter charters were issued, making the total number of local units 114.

For a basic program for 1930 the following activities are named:

Elimination of preferential discounts to public bodies, utilities and others through an alignment of forces with the National Association of Building Supply Dealers, the

cement companies and manufacturers of certain other products.

Speeding up the development of a proper credit structure for the industry, by increasing the number of credit bureaus, perfecting the bureau of contract information and extending the practice of prequalifying bidders.

Development of fair trade practices by joint work with national subcontractors', dealers' and manufacturers' organizations, and through the assistance of the Federal Trade Commission.

Recovery of markets for the general contractors' service, and possibly an effort to increase the flow of money into construction—this to be approached through administrative or legislative action of the federal government, through adjustments of material policies and trade practices mentioned above and through well-directed publicity.

Barge Line Competition Meets Railroad Opposition

Southern Railway Objects to Establishment of Barge Line Taking Advantage of Ohio River Canalization

INAUGURATION by the Mississippi Valley Barge Line Co. of service on the Ohio and Mississippi rivers between Cincinnati and New Orleans is opposed by the Southern Railway in "comments" submitted to the Interstate Commerce Commission on the first application that has been filed by a private water line under the Denison act. Under this law water lines are required to apply for a certificate of public convenience and necessity. When the law was passed the commission issued a certificate to the government barge line, as this had previously been established by the specific direction of Congress.

In support of its contention that neither present nor future public convenience and necessity require operation of the barge line, the Southern states that there is no more need for a new water line between Cincinnati and New Orleans than there would be for a new all-rail line, and asserts that there is not the slightest doubt that the commission would promptly disapprove an application to build such a rail line.

Barge Line Unnecessary, Is Claim

The railroad represents that the barge line would open up no new territory and would result only in the duplication of already adequate facilities, to the probable injury of existing rail carriers and without any compensating benefits to the public. Declaring that every pound of traffic which it moves would be taken from the Southern line and other railroads, the Southern declares that the barge line would deprive the rail carriers of revenue which they are in no position to surrender and would tend to impair the ability of the rail lines south of the Ohio River to serve the public. It is pointed out in this connection that the rate of return for the railways comprising the Southern group has shown a progressive reduction from 5.19 per cent in 1926, to 4.24 per cent in 1927 and 4.14 per cent in 1928, that this is less than the rate for the railways of the United States as a whole and less than the rate of return to any other territorial group except the Northwestern.

Concerning the increasing movement of traffic by barge on the Mississippi and Ohio rivers and their tributaries, the Southern refers to an estimate made by the House committee on interstate commerce that there is now 30,000,000 tons of traffic available for movement by water on these rivers. The railroad declares this movement by water would mean a loss of $150,000,000 a year in the gross revenues of the rail carriers and that a large part of this loss would fall upon the carriers operating east of the Mississippi River and south of the Ohio.

Monopoly Seen for Barge Line

If the commission approves the application of the Mississippi Valley Barge Line and orders the railroads to participate in through routes and joint rates, the differentials under the all-rail rates, says the Southern, should be much less than those sought by the barge line because such differentials, if established, would result in giving to the barge line a complete monopoly to the exclusion of the all-rail routes of all traffic which it desires and has available vessels to transport. Estimating that during the first year of its operation the barge line would deprive the railroads of a gross revenue of $780,000, the Southern comments that standing alone this amount is not large, but that when added to the revenues which the rail carriers are now being deprived of by the government barge line on the Mississippi River, the total is sufficient to affect their revenues appreciably.

If the commission should decide that the Mississippi Valley Barge Line should be permitted to inaugurate barge line service, the Southern contends, the differentials between rail-and-barge rates required to be established and the all-rail rates should be much smaller than the 20 per cent proposed by the barge line. To prove that such a large differential is not necessary to attract traffic to the barge lines, the Southern undertakes to show that the government barge lines have not been able to handle the traffic which has been offered to them, and declares that it knows of no case in which the commission has dealt with barge differentials where there was any real showing that barge-and-rail transportation is cheaper than all-rail transportation. In the absence of convincing proof that the economy in transportation in connection with the barge lines justifies differential rates 20 per cent lower than the corresponding all-rail rates, such differential rates should not be prescribed, the Southern urges, because they not only destroy competition as between the all-rail routes and routes in connection with the rail lines but they give the barge lines a complete monopoly of all traffic which they desire and are able to handle.

Pressure Filters at English Water-Works

Four pressure filters have been installed in the new water-treatment plant of the Rhyl Urban District in England, according to *Water and Water Engineering*, London, of Nov. 20, 1929, p. 507. Aluminum sulphate is used as a coagulant, and the coagulated water passes directly on to the filters. Each filter is 22½ ft. long by 8 ft. in diameter, and has a filtration area of 145 sq.ft. The four filters have a total capacity of 1,500,000 gal. per day when operating at a rate of 108 gal. per square foot per hour. Both air and water wash is provided. An automatic slow-starting device has been installed so that at the beginning of a run filtration proceeds at a very slow rate to obviate wasting the first filter effluent. After filtration the water is treated with either sodium carbonate or sodium silicate, and is finally chlorinated with an automatic chlorine gas apparatus.

Letters to the Editor

Tacoma, Not Seattle, Getting Current From the "Lexington"

Sir—I wish to correct a statement made in your issue of Jan. 9. In your editorial "Rainfall Records," after making several comments concerning the 50-year records of the city of Seattle and the unprecedented dry period of the last few years, you state:

> That these reflections are not a mere matter of curious speculation is shown by the fact that only a few weeks ago Seattle had recourse to emergency aid from a vessel of the U. S. Navy to help out shortage of electric current supplying the city with light and power.

I wish to call your attention to the fact that this is absolutely incorrect, because the vessel to which you refer—namely, the U. S. airplane carrier "Lexington," has never assisted the city of Seattle, but rather the neighboring city of Tacoma, which has an independent system of her own.

While here in Seattle we have had to curtail to some extent the consumption of electric current during the extremely dry period just elapsed, we have, on account of whole-hearted public support of the power conservation program, been able to overcome the crisis without any outside help, a fact of which we may be excused for being proud.

Seattle, Wash., Jan. 16, 1930. A. J. GILARDI, Consulting and Civil Engineer.

* * *

Sir—You have damaged us in an editorial in *Engineering-News Record* of Jan. 9, a damage which is very considerable. Your paper has always been fair with us and we take it that you have done this without knowledge of the facts.

Will you please give us fair treatment and undo the damage as far as possible by publishing the fact that we have never taken any electric current from the "Lexington" and do not expect to? Besides, we are told that the city of Tacoma, which is taking current from the "Lexington," is under orders not to transmit anything over the intertie between Seattle and Tacoma. Therefore we neither look for any current from them nor have we taken anything from them.

Seattle, Wash., Jan. 14, 1930. J. D. Ross, Superintendent of Lighting.

Restricting the Practice of Engineering

Sir—The time has now arrived for all engineers engaged in building construction to unite in defending their right to practice professional engineering. It seems that the architects are now carrying on a concerted national drive for restrictive legislation, to prevent engineers from practicing in the sphere of building construction.

No one ever challenged the engineer's right and competency to supervise the design and guarantee the structural safety of the modern 80-story skyscrapers—at least, not until engineers sufficiently developed the art of building gigantic structures with the utmost precision and structural safety. But now, lo and behold! the architect appears on the scene. He believes in the supremacy of art, decoration and beauty as making for a safe structure and is vociferously proclaiming his divine right to lead the construction industry.

As matters now stand in New York State, the last legislature conceded his claim by passing the architects' registration law, which provides as follows: "In order to safeguard life, health, and property, no person shall on or after the first day of January, 1930, practice architecture in this state or use the title architect, or any title, sign, card or device to indicate that such person is practicing architecture or is an architect, unless such person shall have secured from the regents a certificate as registered architect." It further provides that "this article shall not be construed to affect or prevent the practice of engineering by a licensed professional engineer."

Superficially, the architect's and engineer's rights seem well defined. However, in meting justice to the engineering patient, the dextrous architect injected an effective anesthetic into the law in the following form: "A person practices architecture who does the work that an architect does in planning, designing or supervising the construction or structural alteration of buildings or structures or appurtenances thereto." Under this clause and the multiple dwellings law, building officials now refuse to accept any plans prepared by licensed professional engineers.

In further view of the Appellate Court's adverse decision in the multiple dwellings suit, instituted by the New York State Society of Professional Engineers, it appears that architects have admirably succeeded in excluding engineers from the field of building construction.

Further to restrict the engineer's rights and practice, the New York City building bureaus issued instructions on Jan. 15, 1930, not to accept any more plans for examination by its staff of engineers unless filed by a registered architect.

These facts prove that the architect is a keen business man and is losing no time in devising ways and means of reasserting his pre-industrial era status in the control of building, design and construction. His real reasons for furthering this restrictive legislation, such as just became effective in this state, is tersely expressed in the words of the president of the Producers' Council, who addressed the board of directors of the American Institute of Architects on Nov. 13, 1929, as follows: "Let me say frankly that while having, we hope, our due share of altruistic spirit in wishing to see the control of building operations remain in architects' hands, we have a very real reason of self-interest in this desire. . . We don't want to see a control arise in our building operations under which there may creep in the substitution of inferior products, made simply to sell and get by, that will promote a cheap, less desirable type of building." This is the key to the whole riddle. The post-war innovations by physicists and engineering technicians in standardization and mass production of building methods and building materials do not appeal to architects and others.

I believe this matter vitally affects the professional welfare of all engineers, because it restricts our status to architects' subordinates and compels us to delegate all credit and business of preparing and filing plans to the architect. In my opinion, active, aggressive and co-ordinated effort from the entire engineering professions is necessary to check immediately these bold moves of the architects to deprive us of the right to practice our profession in the sphere of building construction.

New York City, Jan. 24, 1930. MORRIS KAMPF, Consulting Engineer.

Bonnet Carré Spillway Problems

Sir—The communications which you have published regarding the Bonnet Carré spillway are of great interest. In particular, the proposal for a narrower spillway channel, urged by A. B. B. Harris in your issue of Nov. 21, seems to merit careful consideration. He suggests a combined highway, railway and spillway structure at each end of the spillway channel. Such a control structure at the lower end of the spillway channel as well as at the upper end seems vital to the safety, stability and permanence of the spillway channel.

Under normal conditions the water surface of Lake Pontchartrain is but little above Gulf level. I have not seen figures published for the amount of rise in the surface of Lake Pontchartrain when the spillway is discharging at full capacity, but doubtless such estimates have been made. Apparently the rise will be but a few feet, so that if uncontrolled the fall in the water surface from the upper end of the spillway to the lower end will approximate 20 ft. This is enough to produce velocities of high erosive power.

If such scour were permitted to remain uncontrolled, it might extend the whole length of the spillway channel and undermine and destroy the spillway structure at its upper end. Mr. Harris has performed a valuable service in pointing out the necessity for an adequate control of the spillway flow at its entrance into Lake Pontchartrain.

Iowa City, Iowa, Jan. 17, 1930. SHERMAN M. WOODWARD, Dept. of Mechanics and Hydraulics, State University of Iowa.

Equipment and Materials at the 1930 Road Show

Part II

IN LAST week's issue, exhibits of power shovels, cranes and buckets at the Road Show in Atlantic City Jan. 13-17 were discussed. This week some of the more important units of other road-building equipment are mentioned. Lack of space prevents more than brief mention of each.

Paving Equipment

Crushers and Screens—The rotary type of crusher was shown in a 4-ft. size by the Nordberg Manufacturing Company and in model form only by the Western Wheeled Scraper Company. Nordberg also showed a section of its vibrating screen. Two large jaw-crushers with dustproof roller bearings and Alemite lubrication were exhibited by the Wheeling Mold & Foundry Company, which also showed a portable elevating and crushing plant equipped with a 9x36-in. crusher. A somewhat similar plant with a 15x36-in. crusher was displayed by the Universal Crusher Company, which also showed crushers in four other sizes. The Good Roads Machinery Company presented a new portable plant equipped with a roller-bearing crusher having only three moving parts. Other portable crushing plants were exhibited by the Galion Iron Works & Manufacturing Company, the Diamond Iron Works, the Williams Crusher & Pulverizer Company and the W-K-M. Company, the latter using a power take-off drive from the tractor.

Two exhibits which attracted considerable attention were those of the Smith Engineering Works and the Pioneer Gravel Equipment Manufacturing Company. Smith showed two working models: One of an aggregate plant with primary crusher, rotary grizzly, reduction crusher, bucket elevator and heavy-duty screen; the second, a sand and gravel plant with Telsmith plate feeder belt conveyor, washing screen and screw rewasher. Pioneer's exhibit was a miniature screening, crushing and loading gravel plant with vibrating screens.

Vibrating screens and screen fabrics were also shown by the Niagara Concrete Mixer Company.

Belt or bucket conveyors were exhibited by Barber-Greene Company, the Geo. Haiss Manufacturing Company and the N. P. Nelson Iron Works, Inc. The Barber-Greene exhibit was unusually complete and featured a 51-ft. permanent belt conveyor mounted on a welded frame. In addition a truck-mounted belt conveyor and a crawler-mounted bucket loader were included. The latter was supplemented by a power-operated vibrating selective screen which was swung below the discharge point of the buckets. The Geo. Haiss Manufacturing Company showed both a creeper bucket loader and a snow loader of similar design. The Q-7 loader of N. P. Nelson was shown with minor modifications. The O.K. Clutch & Machinery Company exhibited a portable elevator for building construction, and several of the bin manufacturers showed vertical inclosed bucket elevators as charging machinery for their bins.

Bins and Batchers—Equipment for proportioning concrete materials annually presents an interesting study. The trend toward weight proportioning, noted last year, continued at this year's show.

Cement handling tended toward bulk methods. Numerous dust-tight bins were exhibited and the Fuller-Kinyon pumping system for transporting bulk cement made its first appearance for job applications.

Bins were shown by Erie Steel Construction Company, the Butler Bin Company, the Heltzel Steel Form & Iron Company, the C. S. Johnson Company and the Blaw-Knox Company. Erie showed a two-piece portable Aggremeter plant known as its type G. A 40-cu.yd., three-compartment portable bin—for sand and two sizes of coarse aggregate—with weighing hopper permanently attached, was exhibited by the Butler Bin Company. The Heltzel Steel Form & Iron Company exhibited its trailer-weighing Aggrabatcher plant, together with a similar new unit for handling bulk cement. Bin and batcher are dust-tight and were shown in operation in connection with a Fuller-Kinyon pump. The cement flow is controlled by valves and all dust goes back to the hopper. The cement is weighed on a dial scale and an integral part of the layout is a shaker compartment which keeps the cement in a loose condition. The C. S. Johnson Company exhibited a 37-yd. bin with understructure suitable for weighing-batcher attachment. In the Blaw-Knox exhibit was a three-compartment 100-ton portable batcher plant and a two-compartment 51-ton portable batcher plant. With these units the weighing equipment is transported attached.

A new unit for proportioning concrete materials was shown by the Toledo Scale Company. This consists of a scale of the springless type carrying indicators which can be set for the required amount of fine and coarse aggregate, cement and water. This device can be equipped with a graphic recorder which gives a complete record of mixer operations during the day. Compensation for moisture content is made by means of a separate adjustment. Another interesting device exhibited by Toledo was a moisture content and sieve analysis gage.

In the field of batchers the Erie Steel Construction Company exhibited a new combination volume-wegihing Aggremeter. In the Butler Bin Company's exhibit was a cement-weighing hopper and a volume-proportioning hopper. C. S. Johnson showed separate weighing batchers for sand and stone and also a model of its hydrogravic batcher for proportioning the combined sand and water by weight. Blaw-Knox exhibited a triple weighing batcher attached to its three-compartment bin and also a weight batcher for bulk cement. A 1-yd. Blaw-Knox inundator was mounted complete on a frame to show the piping, valves, water tank, etc.

Concrete Mixers—The 27-E pavers, as a class, presented fewer changes than in any recent year. The Ransome Concrete Machinery Company, however, showed a new model in which all gears, except the drum gear, have been inclosed in oil-tight housings. This company also exhibited a 28-S building mixer, a 7-S building mixer and a cut-away section of its plunger-pipe water tank. The Koehring Company which introduced a new paver with inclosed gears at the 1929 show, reported that the only change on the 1930 model was the substitution of a new power plant with 50 per cent more power. The Foote Company, Inc., included several improvements on its 1930 mixer, including the substitution of a no-pressure water-measuring tank for the low-pressure tank formerly used.

The Chain Belt Company has incorporated a larger power plant in its 1930 paver and lowered the over-all height by changing the water tank from an overhead mounting to a side mounting.

From a Road Show Notebook

Numerous new models of 1- and 1½-in. centrifugal pumps driven by small air-cooled engines, portable by any two men capable of carrying 100 lb., could be seen. The Homelite Corporation had a complete line, and other pump manufacturers showed similar units powered by Briggs & Stratton engines.

* * *

Although there were fewer exhibits at the show than last year, some individual exhibits were larger than ever before. On the main floor were the Chain Belt Company with its affiliated companies, and the National Equipment Corporation, and in the basement the United Tractor & Equipment Corporation.

* * *

Not only in the size of the show itself but in individual products displayed in the exhibits is the Road Show the peer of any other exposition held in America. Among the larger pieces of equipment shown this year was the 84-S mixer of T. L. Smith, the 100-ton three-compartment bin of Blaw-Knox, the Cletrac 100 tractor, the 42-in. elevating grader of Caterpillar and the 275-hp. Waukesha engine.

Two-inch larger drum openings are now used and additional buckets and blades have been installed in the drum. Its "mechanical man" automatic system, which synchronizes charging, mixing and discharging operations, has been improved by substituting foot pedals for the hand levers formerly used. The T. L. Smith Company reported no changes in its 27-E paver, but exhibited a new 84-S tilting mixer equipped with its patented "weigh-mix" equipment. This company also exhibited a 10-S non-tilting mixer with skip "weigh-mix" equipment, consisting of a cradle which carries the skip on a Fairbanks platform scale. A new 3½-S tilting mixer with spring suspension mounting was also exhibited, as well as the company's Kwik-Mix line of small machines and plaster and mortar mixers.

The Jaeger Machine Company exhibited a new four-wheel spring-mounted 7-S non-tilting mixer with automatic skip shaker. It is known as the "Speed Queen." This company also exhibited a 10-S non-tilting mixer with a Winslow skip scale featuring three beams, one each for cement, sand and stone. The Chain Belt Company also utilized a Winslow skip scale on its 10-S mixer. The Construction Machinery Corporation exhibited a new 14-S mixer with Timken roller bearings. Other exhibitors of mixing equipment included the Knickerbocker Company, the Leach Company, the Union Iron Works, which showed a high-pressure grout mixer and ejector, the Republic Iron Works and the Gilson Bros. Company.

Forms and Finishing Machines—The outstanding development in this field was the introduction of a new machine by the Lakewood Engineering Company for finish-grading operations. Last year A. W. French & Company, now a division of the Blaw-Knox Company, introduced their Nu-method grader for this purpose. The same machine was shown this year. The Nu-method grader is a self-propelled machine which utilizes mechanical scrapers to bring the road grade to proper cross-section. Spoil material is carried outside the forms by a belt conveyor. The new Lakewood power subgrader mills or picks the surface rather than scrapes it. Depth of cut is adjustable from 6 to 12 in. below the top of the road forms. Lakewood also exhibited a new tandem screed for attachment to its concrete finisher. This machine supplements the single screed or combined screed and tamper. The Blaw-Knox exhibit also included the Ord finishing machine of A. W. French & Company. An asphalt-fluffing attachment was also shown for this finishing machine. The Heltzel Steel Form & Iron Company exhibited its "Flex-plane" machine, a combination finishing and joint-forming apparatus.

Few outstanding changes were reported in road forms. Lakewood exhibited its duo-rail road form, which is its ordinary road form with a separate rail mounted on the stake lugs and designed to give increased strength for carrying heavy finishing and finish-grading machines. In a new form shown by C. G. Abernathy, Hornell, N. Y., the use of adjusting wedges permits the form to be staked down at approximate grade and moved vertically 3½ in. or laterally 1½ in. to exact position. Exhibitors of road forms included the Hotchkiss Steel Products Company, Inc., the Metal Forms Corporation, the Heltzel Steel Form & Iron Company and the Blaw-Knox Company.

The Irving Iron Works exhibited its continuous floor armor as well as its reinforcement and armor for concrete slabs and for grade-crossing construction. In this same classification was the Blaw-Knox "floorgard" and "pavegard," a steel reinforcing for armoring floors and streets. The Alan Wood Iron & Steel Company exhibited its wearing plate for bridge floors. The Concrete Surfacing Machinery Company showed its Berg highway surfacer, a gas-engine driven grinder for removing surface irregularities from concrete and asphalt pavements.

Steel reinforcement, both mesh and bars, was exhibited by the American Steel & Wire Company, the Concrete Steel Company, the Truscon Steel Company, the National Steel Fabric Company and the Wickwire-Spencer Steel Company.

Pavements and Surfaces—Cold application of bituminous material was featured by four exhibitors: the American Bitumuls Company (Bitumuls); the West Process Pavement Company (Westphalt); Flintkote Roads, Inc., (Colas) and the Colphalt Company of Ohio (Colphalt). Other manufacturers of bituminous asphalt paving materials included the Amiesite Asphalt Company, the American Tar Products Company, the Barber Asphalt Company, the Texas Company, the Standard Oil Company of New Jersey, and the MacAsphalt Corporation. Cement manufacturers who maintained booths included the Atlas Lumnite Cement Company, the International Cement Corporation featuring "Incor" and the Hercules Cement Corporation.

Brick was represented by the McAvoy Vitrified Brick Company, the Westport Paving Brick Company, and the National Paving Brick Manufacturers Association. Other associations represented at the show included the Portland Cement Association and the Asphalt Institute.

Paving and flooring blocks of asphalt were shown by the Hastings Pavement Company, which featured the use of asphalt joints in place of sand joints, a new development. At the booth of the Johns-Manville Company were shown asphalt planking for grade crossings and bridge floors and a combination rubber and asphalt joint with unusual elastic properties. This company also displayed samples of Celite, the concrete admixture. The Philip Carey Company showed asphalt composition rail fillers, expansion joints and planking. A new paved grade crossing construction was shown by the W. S. Godwin Company. W. R. Meadows, Inc., displayed Sealtite expansion joints, both plain and felt-sided and also asphalt plank, flashing blocks and rail fillers. The Servicized Products Corporation exhibited asphalt planking, roofing, expansion joints and sewer pipe filler. Expansion joints were also displayed by the Colphalt Company of Ohio.

Six exhibits displayed curing processes for concrete paving. The Columbia Products Company, the Dow Chemical Company and the Solvay Sales Corporation had calcium chloride for this purpose; the Grasselli Chemical Company showed silicate of soda; and McEverlast, Inc., displayed a spraying unit for the asphalt emulsion used in the Hunt process of concrete curing. Curcrete, also an asphalt emulsion, was displayed by the Barber Asphalt Company.

Bituminous Equipment—Distributors for bituminous products were shown by E. D. Etnyre & Company, Inc., the Kinney Manufacturing Company and Charles Hvass & Company, the latter showing a new oval tank. Kinney showed a new pressure distributor improved by the use of larger heaters. Small-scale models of pressure distributors and a new surface mixer were shown by Sam Finley, Inc. The surface mixer consists of primary blades which rotate and tumble the road surface material through a spray of bitumen sprayed through a series of nozzles, and secondary blades which repeat the process in the reverse direction. A rear blade levels the mixture, leaving a layer of bituminous concrete. F. D. Cummer & Sons Company and the J. D. Farasey Manufacturing Company, makers of asphalt plants, also maintained booths.

A new self-propelled portable asphalt plant was exhibited by the Chausse Oil Burner Company featuring a power-driven pump. Another new piece of equipment was a reheater with rotating

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The Chain Belt Company enters the truck mixer field with a unit which discharges its load by reversing the direction of rotation. It is designed to be easily demountable, releasing the truck for other service. Jaeger anticipates a possible new trend by mounting its truck mixer bodies on trailers for operation in trains.

* * *

Automatic and semi-automatic primers on centrifugal pumps eliminate foot valves and permit large pebbles and sticks to pass through the pump. Also, they allow centrifugal pumps with their high-lift characteristics to be used on ditch and sump drainage, where only diaphragm pumps have previously been practicable. At present there are as many automatic primer designs as there are centrifugal pump manufacturers.

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Prepared and patented asphalt emulsions and mixtures are available in increasing numbers. Most of these seem to have their genesis in foreign countries.

drip guard and heating drum operated by a LeRoi engine and equipped with self-generating oil burners. Chausse also showed a new crack filler which blows out dirt with compressed heated air, burning out refuse and heating the crack so that the filler penetrates to the bottom. A push-type crack-filling machine was a part of the Burch Corporation's exhibit. The Hotstuf line of the Mohawk Asphalt Heater Company was represented by an asphalt heater of the trailer type mounted on solid rubber tires with an elevated heating chamber for receiving the cold material. As soon as this becomes liquid it drops down into the main chamber, from which it is distributed by a pump sprayer. Mohawk also exhibited a combination tool and asphalt heater, generally known as a fire wagon; and a trailer tool box with spring suspension on solid rubber-tired wheels. Littleford Bros. showed a new motor-driven spraying attachment on its trailer heater and a new high-speed maintenance kettle equipped with roller bearings in which the flame is used in the same manner as in a return tubular boiler. Littleford also showed the new universal concrete heater attachment for all makes of mixers. An electric tar heater for use in laying wood block floors was exhibited by the Beckwith Machine Company. The Aeroil Burner Company showed heaters for asphalt work and for concreting in cold weather.

Pumps—In pump design, the outstanding feature of this year's show was the number of self-priming centrifugal units offered. In these, the creation of a vacuum in the main pump chamber is usually accomplished by means of an auxiliary unit which, in some designs, runs continuously and in others is shut off as soon as the main pump starts to function. On some of the pumps priming is accomplished by retaining sufficient water in an auxiliary tank. Included in the latter class is a new self-priming centrifugal Humdinger pump of the Ralph B. Carter Company. This develops a 28- to 30-ft. suction lift and will handle 1¼-in. solids. The new self-priming centrifugal pump exhibited by A. S. Marlow included a built-in diaphragm for priming purposes which is automatically cut out as soon as the main pump takes up its load. The American Steam Pump Company showed a self-priming centrifugal pump utilizing a small auxiliary pump for exhausting air from the system. Self-priming units were also included in the exhibits of the Barnes Manufacturing Company, the C. H. & E. Manufacturing Company, the Chain Belt Company, the Domestic Engine & Pump Company, the Homelite Corporation, the Jaeger Machine Company and the Novo Engine Company. Barnes had another new unit, a lift-and-force diaphragm pump. A new principle in plunger pump design was shown by the Novo Engine Company, which utilizes heavy rubber rings to seal the pistons. The C. H. & E. Manufacturing Company also introduced a single-diaphragm pump connected to the driving engine by means of a worm gear.

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The heavier models of motor trucks sold by the White Company are practically built to order, since the purchaser has the choice of much optional equipment, including different motor sizes, six-wheel drive units, front wheel brakes with or without air equipment and the usual variety in bodies and hoists.

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Chas. Hvass & Company showed a pressure distributor with an oval instead of a circular tank. The center of gravity of the former is lower, permitting higher road speeds.

A detailed model of a sand and gravel dredge was exhibited by the Morris Machine Works.

An air-cushion tank to prevent water hammer and to insure a continuous water supply at the mixer on long water lines was shown by the Friend Manufacturing Company, which also exhibited a new quadruplex deep oil-bath high-pressure pump with a capacity of 45 gal. per minute and full roller-bearing equipment. Other pump exhibitors included the John Lauson Manufacturing Company, the Union Iron Works and the Tool & Device Corporation.

The booth of the Moore Trench Machine Company contained two self-priming centrifugal pumps, one driven by an electric motor and the other by a Continental gasoline motor. Both of these units were wheel mounted for quick portability. This company also showed well points, headers and piping for the Moretrench dewatering and drainage system.

Transportation Equipment

Trucks—Developments in the motor truck field continue, in the main, along conventional lines. The Relay Motor Corporation showed its trucks with the unique type of internal gear-driven rear axles which utilize the weight of the trucks themselves to aid in traction. Besides the standard model S-11, 1½-cu.yd. dump truck, Relay showed a new 3-cu.yd. model with a 139½-in. wheelbase. Another new product was the 7-ton model 140 of the Indiana Truck Corporation, which was equipped with a 2-cu.yd. Wood underbody hoist. Other Brockway-Indiana exhibits included a model 290, 15-ton chassis with 4-cu.yd. body, a model 627-AW, 3-yd. body with special three-way hoist and a short wheelbase road-building truck with 1½-cu.yd. automatic dump body. The American Aggregates Corporation exhibited a 3-ton Omort 2½-cu.yd. road-building truck. The advantages of a short wheelbase were also featured by the Autocar Company with a 3½-ton, six-cylinder model SHS dump truck on a 114-in. wheelbase, and the Hug Company, which showed a 4-yd. two-batch truck with the front wheels set back to the rear of the engine. The same principle was followed by this company in a six-wheel truck with a 6½-cu.yd. body and four-wheel air brakes. This truck was equipped with balloon tires and had a capacity of 18,000 lb. Autocar also showed a 3½-yd. body with Heil hoist mounted on a 157-in. chassis with six-cylinder motor.

Other motor-truck exhibitors included the Four-Wheel Drive Auto Company, LeBlond-Schacht, Sterling, White, Stewart, International, Reo, Federal, Dodge Brothers, Chevrolet and Ford. A unit which combines the features of truck and tractor, utilizing a flexible rear crawler unit in place of wheels, was exhibited by the Linn Manufacturing Company. Attachments for converting motor trucks to crawler operation were shown by the Trucktor Corporation on Mack, White and Ford trucks. For heavy traction this company supplies a detachable track mechanism which runs over the rear wheels of the truck and an additional pair of idler wheels installed under the body. The tread is made in either skeleton or solid form, and is also available in rubber. The latter type requires special wheels and is not detachable.

Bodies and Hoists—Refinements in the design of both bodies and hoists were apparent in almost every exhibit of this nature. There was a tendency to inclose gearing and to use anti-friction bearings in the hoist mechanism. The Anthony Company showed an improved rotating power-hoist body utilizing a worm-gear assembly similar to that used in rear axle construction. The Commercial Shearing & Stamping Company showed a three-way dump body with double-cylinder telescoping hydraulic hoists. A hoist capable of shaking the body at any angle was displayed by the Jungerson Dump Body Company. Automatic gravity dump bodies were shown by the Hockensmith Wheel & Mine Car Company and Hercules Products, Inc., which also had power hoists on display. Power dump bodies were shown by the following: Marion Steel Body Company, Perfection Steel Body Company, Galion All-steel Body Company, Chas. Hvass & Company and Lee Trailer & Body Company. Inclosed cabs for the protection of drivers were shown by the Metropolitan Body Company and the Highland Body Manufacturing Company.

The Palmley Flexadrive, shown by the Western Manufacturing Company, mounts a 1½-cu.yd. body on a Ford model A chassis with transmission reversed, so that the unit is run backward. The usual driver's seat is eliminated, a single seat being mounted over one front wheel and all controls centered at that point.

Bodies for the transportation of concrete continued to attract much attention. A new 1-cu.yd. conveyor-conditioner body for mounting on Ford or Chevrolet six-wheel trucks was introduced by Clinton Motors Corporation, which also showed its standard 2- and 3-yd. bodies with high-lift hoists. Another small-capacity body was displayed by the Lee Transit Mixer Company, this being mounted transversly on the

frame of the truck. A newcomer to the show was Parke Concrete Carrier, Inc., with a 3-cu.yd. motor-driven mixer shaped like a truncated cone. The Jaeger Machine Company introduced an innovation—a mixer body mounted on a trailer. The Biehl Iron Works, which, until recently, built only for Clinton, is now distributing bodies on its own account. Transit Mixers exhibited mixer bodies of 2-, 3- and 4-cu.yd. capacity. A body which discharges by reversing the direction of motion was shown by the Highway Truck Mixer Company. The Blaw-Knox Company, the C. O. Bartlett & Snow Company and the Good Roads Machinery Company also showed models of concrete transporting bodies with only minor changes from those shown a year ago.

Tractors—New tractor models were announced at the show by the Cleveland Tractor Company, Allis-Chalmers and the United Tractor & Equipment Corporation. The new Cletrac, known as the 80-60, is a large-size, heavy-duty model equipped with double carburetor and double fan belt. Cleveland also displayed several other tractors with wider treads and other improvements. Allis-Chalmers, in addition to its Monarch 50 and 75 models, showed a new 35 with crawlers driven by gears instead of the chains used in the other models. Bates Steel Mules, models 30, 40 and 80, were exhibited by the Foote Bros. Gear & Machine Company. The Caterpillar Tractor Company was represented by models of all sizes from 10 to 60 hp.

One of the largest and most varied exhibits at the show was sponsored by the United Tractor & Equipment Company. Most of the company's products, which include motor graders, rollers, bulldozers, arc welders, compressors and other related machinery, are built around the United power unit, manufactured by Allis-Chalmers. The United exhibit included agricultural and industrial tractors mounted on wheels, other models with crawler treads, and tractor attachments for various purposes which are described elsewhere.

McCormick-Deering industrial tractors and power units were displayed by the International Harvester Company, New equipment for attachment to McCormick-Deering tractors, shown by the Trackson Company, included a semi-crawler to replace the rear wheels.

Perhaps the most unusual piece of equipment at the show was the Koehring Dumptor, which consists of a 5-cu.yd. steel body mounted on high-speed crawlers, each driven independently by a four-cylinder engine. The body is dumped by a hydraulic hoist and is so designed that in dumping position it can be used as a bulldozer. Somewhat similar in construction was the 3-cu.yd. unit shown by the Winsor Company, built around a single McCormick-Deering power plant. The body is mounted on crawler treads and wide-flanged steel wheels, used for steering. Dual controls allow operation in either direction. This body also can be used for bulldozing. The axle which carries the steering wheels is of an unusual pivoted construction designed to keep the wheels straight up and down regardless of the angle of inclination of the machine itself. The Hughes-Keenan Company included in its display a 4-yd. Iron Mule mounted on a McCormick-Deering 10-20 tractor with crawler treads and a 2-yd. wheel-mounted unit on a United Tractor.

Trailers—For transporting excavated material by means of tractor power the Western Wheeled Scraper Company exhibited a 5-cu.yd. bottom dump wagon mounted on Athey truck wheels with a new tractor hitch which makes it possible to operate such units in trains. A similar wagon on wide steel wheels in 6-cu.yd. size was exhibited by the A. Streich & Brothers Company. On this unit the winding and dumping mechanism is actuated by the rear wheels. This company also showed a track-laying wheel mounting of the type used on its bottom dump wagons of 7-, 10-, 18- and 20-cu.yd. sizes. Wagons with crawler treads were also shown in 7- to 8-cu.yd. size by the Athey Truss Wheel Company; in 10-ton size by the American Manganese Steel Company; also by Rex-Watson Company and the Euclid Crane & Hoist Company. A wheel-mounted side dump trailer was shown by the Highway Trailer Company.

Semi-trailers on single crawlers included the model 8150 trailer of the Rex-Watson Company; the 61-91-cu.ft. bottom-dump, spring-suspended unit of the Trail-it Company, which has a welded steel body and wooden doors; and the model 85, all-steel bottom-dump semi-trailer of 8½-cu.yd. capacity manufactured by the Smith Trailer Corporation. Dumping doors on the latter are operated by pneumatic cylinders. The Trackson Company showed a new crawler unit for attachment to trailer wagons.

Heavy-duty trailers for the transportation of large equipment were shown by the Rogers Brothers Company, the G. H. Williams Company, the Fruehauf Trailer Company and Charles Hvass & Company. Of these, the heaviest was a 70-ton gooseneck type trailer, mounted on twelve wheels, shown by Rogers. The entrance of the G. H. Williams Company into this field is marked by its exhibit of a 28-ton girder-type unit.

Locomotives—A 25-ton standard-gage locomotive with dual power plant was exhibited by the Cincinnati Car Corporation, which also showed a small 4-ton locomotive with McCormick-Deering power. The Milwaukee Locomotive Company showed a model H-6 8-ton gasoline locomotive for operation on 36-in. gage track. A larger unit was shown by the same company outside the exhibition hall. Brookville locomotives were represented at their own booth by a 4-ton model using a model A Ford power plant. In this machine the Ford differential and transmission with chain drive has been replaced by a new differential and locomotive type transmission. Brookville was also represented by a small locomotive in the exhibit of the United Tractor & Equipment Company.

Hoists—The most notable advance in hoist construction at the show was the 100-hp. safety hoist of the Lidgerwood Manufacturing Company which, in addition to the usual foot-operated band brakes, is equipped with an automatic safety brake to prevent dropping the load in the event of power failure or neglect of the operator to keep his feet on the brake levers. The Clyde Iron Works showed an 80-hp. double-drum hoist with bronze-bushed drums, arc-welded bed, machine-cut gears and inclosed chain drive. Inclosed chain drive was also featured by the S. Flory Manufacturing Company in a new 15-25-hp. gasoline hoist. A new rope-control electric hoist was shown by the Chisholm-Moore Hoist Company, which also displayed a large assortment of hand chain hoists. Other hoist manufacturers represented at the show included the McKiernan-Terry Corporation, Orr & Sembower, the Beckwith Machine Company, the Jaeger Machine Company, the Diamond Iron Works, the O.K. Clutch & Machinery Company, the Novo Engine Company and the Trackson Company.

Excavation by cable was shown in full detail by Sauerman Brothers, Inc., which had a small working model of its slack-line cableway and power drag scraper in operation. Recent improvements include a new type of swivel head on the mast and the use of heat-treated pressed steel in the guide blocks.

Engines—Diesel engines, while not many in number, received a great deal of attention from those attending the exposition. The Buda Company had two of its M. A. N. machines—a 120-hp. and a 180-hp. In addition, this company showed one of its new six-cylinder series of gasoline engines, which feature crankcase ventilation, chrome nickel iron in crankcase and cylinder block and full force-feed lubrication. The new Blue Streak line of the Climax Engineering Company was represented by a 5¼x6½-in. 100-hp. unit and a 6x7-in. 155-hp. The Continental Motors Corporation showed several Red Seal L-head motors and the new model H-24 four-cylinder slow-speed engine with dry sump oiling system and re-

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Fewer chain drives for motor trucks were shown than ever before; even the heaviest units are appearing with shaft drive, usually through a worm gear. Solid rubber tires were shown instead of pneumatics on most of the trucks on display. The superior holding power of pneumatic tires in slippery going is probably a large factor in this change.

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The central mixing plant is bringing bulk cement to the fore. Butler, Blaw-Knox, Eric, Johnson and Heltzel showed bin equipment for handling it. Heltzel had its dust-tight equipment in operation in conjunction with a Fuller-Kinyon conveying system.

movable cylinder sleeves. The Waukesha Motor Company showed ten engines, four and six cylinders, ranging from 25 to 325 hp., and also a new diesel engine, not yet in production, which develops 125 hp. and is based upon gasoline engine design modified for diesel operation. This motor is started on gasoline by means of a small carburetor and magneto, and is switched over to heavier fuel as soon as combustion has started. Wisconsin Motor Company displayed one four-cylinder and two six-cylinder engines, the latter including a 110-hp. unit representative of the new series equipped with double carburetor and double oil filter. Two diesel engines of 80 and 180 hp. were exhibited by the Atlas-Imperial Engine Company.

Although most of the manufacturers already named also showed smaller engines, a number of makers concentrated on this type. Hercules Products, Inc., showed several small tank-cooled gas engines with new type of inclosure. Both radiator- and tank-cooled engines were exhibited by the Fuller & Johnson Manufacturing Company. The use of anti-friction bearings was featured by the Novo Engine Company. The Stover Manufacturing & Engine Company showed three vertical engines of one, two and four cylinders ranging in power from 2 to 16 hp. and a 2-hp. horizontal motor. Other exhibitors of small power plants included the Ford Motor Company, the John Lauson Manufacturing Company, the Briggs & Straton Corporation, the Cummins Engine Company and the Homelite Corporation.

Highway Service Equipment

Snow Removal—For snow removal, in addition to the various types of loading equipment, there were several exhibits of chemicals which have recently been adapted to snow-melting service. The Solvay Sales Company and the Dow Chemical Company exhibited calcium chloride for removing ice and snow. The Associated Engineering Development Corporation exhibited a secret chemical known as Barnes Snowmelt, developed by Horace T. Barnes, professor of physics at McGill University, Montreal. This material, which is neither calcium chloride nor thermite, is applied with any type of apparatus that will spray water by pressure.

Among the snow-removal equipment manufacturers was the Joy Manufacturing Company with its self-propelled snow loader utilizing a self-feeding conveyor with special gathering arms mounted eccentrically on revolving disks. N. P. Nelson Iron Works, Inc., exhibited its snow loader—built around a McCormick-Deering tractor. Loaders were also exhibited by the Barber-Greene Company and the Geo. Haiss Manufacturing Company. The Walter Motor Truck Company showed its heavy snow-fighter truck with a hand-operated V-type plow ahead and a hand-operated underbody snow scraper on a circle beneath. The Wausau Iron Works displayed its huge new plow built around a Caterpillar 60 tractor. This plow, which is raised and lowered by two hand-jacks, is also equipped with side wings operated by mechanical lifts powered from the tractor take-off. Similar units built around Caterpillar 15 and 30 tractors were also shown, together with a still lighter unit with wings, for attachment to motor trucks. Other snow plow exhibitors included the La Plant-Choate Company, the United Tractor & Equipment Company, and the Chevrolet Motor Company.

Signs and Signals—Reflecting signs which utilize the light of an approaching car to show an illuminated signal at night were shown by the National Colortype Company, the Municipal Street Sign Company, the Ray Sign Corp. and the Reflex Sign Company.

Considerable attention was attracted by the exhibit of the Automatic Signal Corporation, which showed a small-scale model of a street intersection controlled by automatic signals actuated by approaching cars. Wallace & Tiernan, Inc., showed dry cell signals turned on and off by a switch actuated by sunlight. Flashing signals were also shown by the American Gas Accumulator Company, the Traffic Equipment Corporation, the Welsbach Traffic Signal Company and the Western Stamping & Manufacturing Company. Servicized Products Corporation showed rubber signs to be set upright in the street. These can be run over without damage to sign or vehicle.

Small Tools and Equipment—The General Wheelbarrow Company showed a measuring tray wheelbarrow for accurate concrete mixing on small jobs. Electrically operated saws and small tools were exhibited by the De Walt Products Corporation and by Wappat, Inc. Shovels, spades and post hole diggers were shown by the Conneaut Shovel Company, the Skelton Shovel Company and the Wyoming Shovel Works. The Blackhawk Manufacturing Company showed a number of hydraulic jacks and a line of socket and open-end wrenches. Wrenches and small tools in great variety were shown by the Snap-On Wrench Company and Stevens-Walden, Inc. Cable cutters, speed indicators, rules, wire twisters and other small tools were shown by Montgomery & Company. Tapes and rules for all purposes appeared in the booth of the Lufkin Rule Company. Branding irons for wood-handle tools were exhibited by the Everhot Manufacturing Company.

Miscellaneous Service Equipment—Many types of guard fencing for highways were shown, varying from the net-type fencing of the American Wire Fence Company, the Anchor Post Fence Company, the Cyclone Fence Company, the Page Steel & Wire Company and the Wickwire-Spencer Steel Company to the special offset rail sections shown by the Carlisle Foundry Company and the Standard Iron Works. On these two products the rail itself is offset from the post supporting it in order to minimize damage to a car which may strike the fence. The McCloskey Torch Company and the Toledo Pressed Steel Company showed oil-burning torches for guarding road obstructions, and the Rawls Manufacturing Company showed a number of motor-driven mowing machines for shoulder maintenance. These included two models on three-wheeled rubber-tired self-propelled trailers and a special attachment mounted on a Caterpillar 10 tractor. There was also a one-man single-wheel unit with plow-handle control. The use of heavy chains in grizzlies, feeders and screens was illustrated by the Ross Screen & Feeder Company by means of models. A belt-conveyor-type car unloader and a stone spreader were exhibited by the Burch Corporation. A chip spreader for covering oily or slippery pavement, designed to be towed by a tractor, was displayed by the Goroco Mechanical Spreader Company. Highway Service, Inc., showed Handy Sandy Spreaders, and the Galion Iron Works & Manufacturing Company a stone spreader for attachment behind trucks.

Other Exhibitors, at the Show

Unfortunately it is impossible to give detailed attention to every one of the interesting exhibits at Atlantic City. The following list gives the names of firms that displayed products not readily included in the classifications already listed:

Alloy Cast Steel Company.
American Manganese Steel Company.
American Steel & Wire Company.
American Bosch Magneto Company.
Robert Bosch Magneto Company.
Bragg-Kliesrath Corporation.
Charles Bruning Company.
Bunting Brass & Bronze Company.
Commercial Steel Casting Company.
D-A Lubricant Company.
Dayton Steel Foundry.
Eaton Axle & Spring Company.
Eisemann Magneto Corporation.
Electric Wheel Company.
Erie Malleable Iron Company.
Fafnir Bearing Company.
French & Hecht, Inc.
Fuller & Sons Manufacturing Company.
Gears & Forgings, Inc.
Geneva Metal Wheel Company.
Hamilton Manufacturing Company.
Hazard Wire Rope Company.
Hyatt Roller Bearing Company.
Interstate Drop Forge Company.
Jones Superior Machine Company.
Kohler Company.
Leschen & Sons Rope Company, A.
Milburn Company, Alexander.
Modine Manufacturing Company.
Morse Chain Company.
Motor Improvements, Inc.
M. & M. Wire Clamp Company.
National Carbide Sales Corporation.
National Carbon Company.
New Departure Manufacturing Company.
Norma-Hoffmann Bearings Corporation.
Nugent Steel Castings Company.
Olsen Testing Machine Company, Tinius.
Page Steel & Wire Company.
Pels & Company, Henry.
Perfex Corporation.
Prest-O-Lite Company, Inc.
Ramsey Chain Company.
Rector Gasifier Company.
Richmond Screw Anchor Company.
Russell Manufacturing Company.
S.K.F. Industries, Inc.
Sivyer Steel Casting Company.
South Bend Lathe Works.
Splitdorf Electrical Company.
Spicer Manufacturing Company.
Stearns Conveyor Company.
Steel Castings Development Bureau.
Taylor Wharton Iron & Steel Company.
Timken-Detroit Axle Company.
Timken Roller Bearing Company.
Tite-Flex Metal Hose Company.
Toledo Pressed Steel Company.
Twin Disc Clutch Company.
Universal Bearing Metals Corporation.
Warren-Knight Company.
Western Crucible Steel Casting Company.
Western Metals Specialty Company.
Westinghouse Air Brake Company.
Westinghouse Electric & Manufacturing Company.
Wico Electric Company.
Williamsport Wire Rope Company.
Young Radiator Company.
Zenith-Detroit Corporation.

News of the Week

U. S. War Department Reverses Decision on New Orleans Bridge

Approves Hero-Hackett Span With Change to Cantilever Form and Increase in Clearances

AFTER requiring drastic changes in design, the U. S. War Department on Jan. 27 approved plans for the Hero-Hackett bridge, to connect New Orleans and Gretna, La., over the Mississippi River. In place of the suspension bridge heretofore proposed, a structure of the cantilever type will be built, it being feared that foundation conditions would make it difficult to provide proper anchorage for a suspension bridge. Clearance requirements have also been increased, the approved plans calling for a channel span 1,760 ft. from center to center of piers, with a midway vertical clearance of 175 ft. above maximum high water, which is set as being a 20-ft. stage on the Carrollton gage. This stage will not be exceeded after the Bonnet Carré spillway is completed.

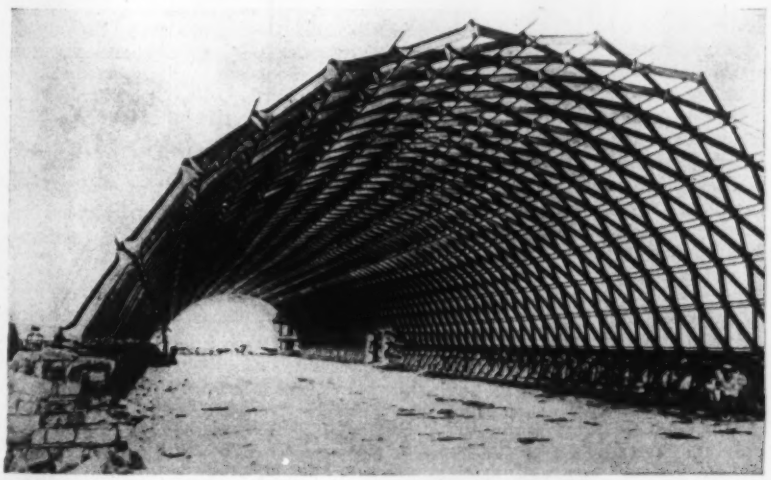
The decision constitutes a complete reversal of the policy enunciated by General Jadwin, who took the position that no bridge should be allowed between a major harbor and the sea, or within the primary waters of a major harbor. Henceforth, it is stated, the War Department on bridge applications will consider simply the question of interference of navigation, without regard to the economic factors involved. General Jadwin, in his report on the project, expressed doubt as to the foundation conditions at the Hero-Hackett bridge site. General Brown, his successor, takes the position that a firm of the standing of Waddell & Hardesty are in a position to pass judgment on a question of that character, especially in view of the fact that the Cooper River bridge, recently completed at Charleston, S. C., rests upon more unsatisfactory material than that disclosed in the borings at New Orleans.

The use of spiral ramp approaches to reach the bridge level is retained in the revised plan. Although this feature has not been used in bridge construction in this country, such ramps are successfully used on a bridge over the Danube River at Budapest.

Syracuse Crossing Elimination Plan Approved

Relocation of the lines of the New York Central R.R. through Syracuse, N. Y., was approved Jan. 23 by the Interstate Commerce Commission, eliminating the last obstacle to this $30,000,000 project. Construction is expected to start in April of this year. The plan provides for the operation of New York Central trains on an elevated structure over the tracks of the West Shore line, eliminating about 55 grade crossings within the limits of Syracuse and East Syracuse.

STEEL LAMELLA ROOF ON TURKISH AIRPLANE HANGAR



Materials for building this hangar in Turkish Asia Minor had to be transported approximately 125 miles by camels and mules. The relatively small dimensions of the component parts used in lamella roofs led to the utilization of this type of construction, with the substitution of steel members for the wood ordinarily used. The hangar will be used by airplanes of the Persian air lines of the German Junkers Co.

A.G.C. Considers Many Problems at New Orleans Meeting

Membership Reorganization Expected to Increase Income—A. E. Horst Elected to Presidency

Engineering News-Record Staff Report

MORE than 600 members and guests attended the eleventh annual convention of the Associated General Contractors of America held at New Orleans, La., Jan. 20-23. The most important action of the convention was the approval of a report by the committee on bylaws and rules of procedure providing for the reorganization of the association to establish a grade of membership which will pay dues directly to the national association, in addition to those paid to chapters with which such members may affiliate. The determination of the amount of dues to be paid to the national organization by the members of chapters and branches has been established upon a sliding scale based upon the volume of work done by each member. This provision will become effective not later than Jan. 1, 1931. It is expected that the operation of these changes will provide a substantial increase in the revenues of the national association, thereby enabling it to carry on an expanded program of service to its members and chapters.

Election Results

The following officers and directors were elected to serve for 1930: president, A. E. Horst, Rock Island, Ill., and Philadelphia, Pa.; vice-president at large, James E. Cashman, Burlington, Vt.; vice-presidents, H. P. Treadway, Kansas City, Mo., and T. H. Banfield, Portland, Ore.; directors, districts 2 and 3, Frank S. Bache, White Plains, N. Y., and E. P. Forrestel, Akron, N. Y.; districts 4 and 5, W. R. Hughes, Jr., Philadelphia, Pa.; district 7, T. J. Baker, Milwaukee, Wis.; districts 12 and 13, Ashton Glassell, Shreveport, La.

The board of directors, meeting Jan. 24, appointed a council of four members to serve with the president in lieu of a general manager in directing the affairs of the association during the ensuing year. In addition to President Horst, this council consists of George B. Walbridge, Detroit, Mich.; Frederick L. Cranford, Brooklyn, N. Y.; Alan Parrish, Paris, Ill., and W. A. Bechtel, San Francisco, Calif. The board also appointed an executive committee to consist of President Horst, Vice-Presidents Cashman and Treadway and T. J. Baker, of Milwaukee, T. T. Flagler, of

Atlanta, H. H. Wilson, of Harrisburg, and John W. Cowper, of Buffalo.

By resolution formally adopted by the convention the association pledged its continued efforts toward accident prevention and recorded its opposition to the imposition of inflexible safety codes and legislation. It provided for joint action with the National Builders Supply Association to investigate and discuss with manufacturers measures looking toward the discouragement of preferential discounts on construction materials to certain consumers. A recommendation was approved to the effect that the Federal Reserve Bank should survey the need for credit in home building and that funds should be set aside to be used by member banks for such construction under terms and interest rates which would tend to stimulate home building. The association urged careful scrutiny of the activities of "racketeers" in collecting graft in the name of organized labor and urged the co-operation of the entire industry, labor organizations and public authorities to eradicate this evil. Opposition was formally registered to U. S. Senate Bill S-2559, introduced by Senator Norris, of Nebraska, on the ground that it would authorize and encourage the use of convict labor in the construction and maintenance of public works and roads.

Resolutions were adopted also to record the appreciation of the association for the action of the Secretary of Commerce in according adequate recognition to the construction industry in the conduct of the 1930 census, and its co-operation was tendered to the administration in behalf of both the census and the efforts devoted by the President's conference to stabilize business conditions through the intelligent administration of the national construction program.

The association formally recorded its respect for the memory of the late Daniel A. Garber and its gratitude to him for his service, and offered its appreciation to George B. Walbridge, who assumed the management of the association after the death of Mr. Garber.

For Uniform Railroad Construction Contract

A recommendation was approved that the association ask the co-operation of the railroad executives of the country toward the general adoption of a uniform railroad construction contract more equitable toward the contractor than some forms now in use. On recommendation of the engineering construction division, the convention recorded its opposition to the practice of some bonding companies in providing free bid bonds, certified checks to accompany bids and guarantees of bank credits; and on recommendation of the building division the headquarters office was requested to investigate the possibility of discounts on compensation insurance premiums for A.G.C. members as a whole, or at least for those who participate in accident prevention competitions. The William F. Tubesing cup for the best two-year record in accident prevention went to the Oakwood Construction Co., of Detroit; the Robert L. Reisinger cup to the Louisville chapter, and the Sumner Sollitt cup to the W. S. Pocock Co., of Detroit.

The building division elected as chairman Chester W. Wright, of Niagara Falls, and as vice-chairman Sam Hotchkiss, of St. Joseph, Mo. The engineering construction division re-elected as chairman Alan Parrish, of Paris, Ill., and as vice-chairman C. E. Bressler, of Santa Ana, Calif.

S. M. Williams, manager of the engineering construction division, reported for the bureau of contract information that to date performance records and statements of contracts on hand had been received from 1,512 contractors. During the course of the convention the bureau received indorsement and assurance of co-operation from the representatives of the bonding companies and from the architectural profession through C. Herrick Hammond, president of the American Institute of Architects. The convention was addressed by D. Hugh P. Baker, manager the trade association department of the U. S. Chamber of Commerce and by Willard T. Chevalier, publishing director, *Engineering News-Record* and *Construction Methods*.

ANTON E. HORST

Discussions on accident prevention were presented by W. F. Austin, chairman of the committee on accident prevention; by John W. Cowper, president, J. W. Cowper Co., Inc., and by W. A. Dearborn, chief engineer, Federal Mutual Liability Insurance Co. James F. Collins described the operation of the California contractors' license law. W. W. Campbell, president of the National Builders Supply Association, and A. J. Burrage, secretary, International Cut Stone Contractors' and Quarrymen's Association, discussed the common problems of the contractors and material men. C. Herrick Hammond, president the American Institute of Architects, spoke on the relations between architects and contractors and emphasized the desire of the architectural profession to eliminate unrestrained competition in bidding for building contracts in order that architects may be able to confine their choice of a contractor to firms of comparable merit.

Speaking before the engineering construction division, A. H. Hunter, engineer, Illinois Highway and Contractors' Association, outlined the requirements of effective association work in the construction industry, and a paper by R. H. Baker, Tennessee Commissioner of Highways, discussed the necessity for prequalification in engineering construction. Before the building division meeting L. I. McQueen, Credit Association of Western Pennsylvania, described the nature of a proper credit structure, and G. F. Meyne discussed the lien law. In a report of the committee on construction development A. P. Greensfelder, of St. Louis, described the provision that has been made for segregating the vital statistics of the construction industry in the forthcoming national census of 1930. He described this as the first real opportunity that has been afforded to compile accurate data as to the resources and operations of the industry and urged full co-operation by constructors in making the census returns accurate and comprehensive.

Railway Bridge Over Newark Bay Opened to Traffic

On Jan. 23 the first train crossed the new bridge over Newark Bay constructed jointly by the Pennsylvania and Lehigh Valley railroads. The double-track structure has a total length of 4,025, including a 322-ft. vertical lift span with clearances of 35 and 135 ft. closed and open. It replaces an old bridge 5,580 ft. long, the swing span of which had a clearance of less than 10 ft. During construction of the new bridge the lift span, while being erected on falsework, was displaced by a high wind and sank into the waters of the bay. It was successfully recovered, however, and is now in service. (*Engineering News-Record*, April 4, 1929, p. 566; July 11, p. 73; and July 25, p. 134.)

Committee Formed to Encourage Building Activity

At a recent meeting in Washington, D. C., attended by more than 100 representatives of the various industries interested in the construction field, a permanent committee to encourage building activities was formed in support of President Hoover's business stability program. Personnel of the committee is expected to be completed within 30 days. The work which it will undertake falls under three general classifications: (1) to present to the public through an advertising campaign information showing that conditions are now especially favorable for construction; (2) to make a survey of proposed new building, remodeling and replacement

projects; (3) to facilitate the financing of building projects.

The conference brought out the fact that, while funds available for construction loans were scarce a short time ago, the situation in this regard has materially improved since the first of the year.

Architects Law Interpreted to Restrict Engineering

Attempts to restrict the filing of plans for all classes of buildings with the city building department of the State of New York to architects and owners only, which began with the passage of the multiple dwellings act in 1929, culminated in an interpretation of the architects registration law of the state which prevents engineers from filing plans for buildings. A modification of the architects registration law, passed in 1929 to become effective Jan. 1, 1930, so amplified the definition of the practice of architecture as to make it include the practice of structural engineering as applied to building construction. This law, however, specifically stated that it was not intended to restrict the practice of professional engineering.

Immediately following the effective date of this law, it was brought to the attention of the building department of New York and other cities by the registered architects, with the result that an appeal was made to the state Board of Regents, under whose jurisdiction administration of all license laws in the state is placed, for a ruling as to whether it affected licensed engineers. As the Board of Regents has not yet formulated rules in the matter, the board referred it to the attorney-general. To the inquiry the deputy assistant attorney-general replied:

"In view of this fact [that the Regents have not formulated rules or regulations] I would not feel justified in interpreting sections of the law at this time. I would suggest, however, that until such a time as you were advised that rules have been formulated you be guided by the provisions of the law itself, particularly with reference to the provision which makes it a misdemeanor for any person, other than registered architects, to design plans and specifications for structures, or alterations exceeding $10,000 in cost."

The matter now rests with the Regents of the University of the State of New York. Upon their rules and regulations in regard to the law will depend whether only architects or both architects and engineers may file plans for buildings. In an attempt to assist the Regents, the architects' and engineers' boards met recently and adopted the following statement: "In furtherance of the provisions contained in section 1476 of the architects law involving 'safeguards to life, health and property,' there is recognized the existence of a certain class and type of buildings, defined generally as industrial buildings—that is, buildings devoted to manufacturing, power development, storage, docks, etc.—which may be for the purpose of interpreting the provisions of the engineering law, considered as 'practice of professional engineering' as defined in section 1466 of the engineers law." Under such an interpretation, engineers could not act as principal agents for owners except on industrial building work.

Illinois Engineers Try New Plan at Annual Convention

Technical Sections Hold Consecutive Meetings on Single Subjects—Local Chapter in Charge

Engineering News-Record Staff Report

HOW to arrange sectional meetings and yet enable a member to attend any or all meetings at a convention is a problem which the Illinois Society of Engineers has solved by assigning to each of its sections a whole or part of a session, with its own chairman presiding. In its three-day convention at East St. Louis, Ill., Jan. 22-24, the society had seven section meetings, a business meeting, an afternoon of excursions and the annual dinner and entertainment. At the dinner the principal address was on "The Relation of Economics to Engineering," by Prof. Charles M. Thompson, dean of the college of economics at the University of Illinois. There was a total registration of more than 200 members and visitors at the convention.

A novel and interesting feature was that some of the sections had selected each a single subject, different phases of which were presented in the several papers. Thus well-water supply was the main subject of the water-supply section, the engineer's work in developing such supplies being covered by H. L. White, of the Illinois State Water Survey, while geological conditions were discussed by G. E. Ekblaw, of the Illinois State Geological Survey. The desirability of definite specifications in contracts for well drilling was urged by J. A. M. Robinson, consulting engineer, Chicago. In the sewerage section, a proposed system of combined sewers for Decatur, Ill., was described by W. D. P. Warren, consulting engineer, who showed how the design was based on the performance records of existing sewers. Sewage-works for an industrial plant at Peoria were described by H. W. Harman, and operating experience at the Springfield sewage-works was reviewed by C. C. Larsen. Experiments in the production of gas from sewage sludge and cornstalks were described by A. M. Buswell, chief of the Illinois State Water Survey. A new law passed in 1929 to consolidate authority in regard to stream pollution was outlined by H. F. Ferguson, chief engineer of the state department of health.

Three papers in the structural section dealt with the Eads bridge, deflection studies of reinforced-concrete beams at the University of Illinois and studies in the design of such hydraulic structures as locks and dams. In the mining and mechanical section, five papers dealt with various aspects of strip or open-cut coal mining in Illinois. Pumping in drainage districts was the subject of two papers in the drainage section, one of these outlining the factors affecting cost. Errors in government land lines, as discovered by engineers and surveyors, were dealt with in the surveying and city planning section by W. D. Jones and gave rise to considerable discussion, as did a paper on subdivisions in rough land by Fred Morse. The organization and purposes of the Illinois Registered Land Surveyors Association were outlined by Morris Greeley of Chicago. At the meeting of the road and pavement section two papers dealt with the need of adequate inspection, and reference was made to the evils of political appointment of incompetent men to act as inspectors on engineering work. County construction of gravel roads as the secondary road system in Illinois was the subject of a paper by Theodore Plack, of the state division of highways.

Officers Elected

Officers elected for the current year include: president, A. J. Schafmayer, chief engineer of the board of local improvements, Chicago; vice-president, Harry F. Ferguson, chief engineer of the Illinois State Board of Health, Springfield, Ill.; secretary, W. D. Gerber, engineer of the Illinois State Water Survey, Urbana, Ill. This meeting was managed by the St. Clair County chapter of the society and by invitation of the Rockford chapter the next meeting will be held at Rockford, Ill., in January, 1931.

General Harry Taylor Dies

Harry Taylor, major-general, U. S. Army, retired, former Chief of Engineers, died of pneumonia at his home in Washington, D. C., on Jan. 28. Gen. Taylor retired from active service on June 28, 1926, when he was succeeded by Gen. Edgar Jadwin. At that time he had seen 46 years of service in the Corps of Engineers, two years of which time he had been Chief of Engineers and over one year as chief engineer officer of the American Expeditionary Forces.

Gen. Taylor was born in Tilton, N. H., June 26, 1862, and was graduated from the U. S. Military Academy in 1884 and from the Engineer School of Application in 1887. His military service was entirely in the Corps of Engineers and extended over much of the United States and its territories, largely in coast defense work at Boston, New York, Puget Sound and in the Philippine Islands.

For his services in France on the construction of port facilities and depots he was awarded the Distinguished Service medal by the U. S. government and was made a Commander in the French Legion of Honor.

American Concrete Institute Convention Program

Six main topics and five technical sessions will occupy the American Concrete Institute at its 26th annual convention in New Orleans Feb. 11-13. These are: (1) methods of manipulating the mix; (2) curing methods; (3) variations in portland cement; (4) concrete specifications for the small job; (5) building design and construction; (6) concrete in flood-prevention and shore-protection work. In addition, the manufacturers of concrete products are to consider two chief topics—the use of color, and concrete products plant layout. Numerous committee reports will be presented under the new author-chairman plan—a plan in which the chairman of the committee writes the report, which is criticised by each member of the committee and then revised. Special papers on the program include: "Concreting Methods at Chute-a-Caron Dam," by I. E. Burks, concrete technician for the Alcoa Power Co.; "The Effects of Variations in Curing Conditions of Concrete," by H. F. Gonnerman, manager, research laboratory, Portland Cement Association; "Concrete in the New New York Code," by P. A. Phillips, Turner Construction Co.; "Design and Construction of the Bonnet Carré Spillway," by Capt. Helmer Swenholt, Corps of Engineers, U. S. Army; "Making and Placing Concrete Revetment Mat," by Lieut. Morris W. Gilland, Corps of Engineers, U. S. Army; and "The Design of Gulf Shore Protection Structures," by J. B. Converse, consulting engineer, Mobile, Ala.

W. M. Acheson, N. Y. State Engineer, Drops Dead

William M. Acheson, chief engineer of the department of public works of New York State, dropped dead in an Albany club on the evening of Jan. 25. Except for a brief interval as chief engineer for the Crescent Portland Cement Co., he had been in the service of New York State since 1913, rising successively through various positions until appointed chief engineer in 1927. This position corresponds to that of state engineer in other states. Educated at Rensselaer Polytechnic Institute and Union University, Mr. Acheson began his engineering career in 1900, with the Troy water-works department. Two years later he was placed in charge of construction of the Quackenkill diverting dam. In 1904 he joined the engineering staff of the Panama Canal and subsequently was promoted to be acting resident engineer in the bureau of municipal engineering and engineer in charge of the third district of the Pacific division, which included the bureaus of municipal, sanitary engineering and building construction. He left the Canal Zone in 1910 to become supervising engineer of the County Construction Co. in New York State. During the World War Mr. Acheson served as lieutenant-colonel in the Corps of Engineers.

The Business Outlook

Basic industrial activity has quickened, though primary distribution and general trade are seasonably slack and still somewhat hesitant. Steel mill operations showed a fairly sharp increase of about 4 per cent for the week. The average for the industry is slightly above 69 per cent, compared with a little less than 66 the preceding week and 84 last year at this time. It will be better in the end if business revival proceeds, as it now does, slowly and firmly. Call money rates are too low and general commercial rates are still too high to risk the possible effect on the stock market of a false start in business recovery. Revival would probably be facilitated and not much endangered by a further lowering of rediscount rates. We should expect this any week now.

—The Business Week, Jan. 29.

Special Master Appointed to Hear Delaware Division Case

The appointment of Charles N. Burch of Memphis as special master to take evidence in the dispute between New York City and the State of New Jersey over diversion of the upper tributaries of the Delaware River was announced in an order of the U. S. Supreme Court Jan. 27. Mr. Burch will be granted the power to issue subpoenas for witnesses and to take such evidence as may be introduced. He has been directed to make findings of fact as well as conclusions of law.

According to court practice in such matters, the special master will submit his conclusions and findings to the court, together with recommendations for a decree. These findings, as well as the recommendation, while not binding on the court, will carry considerable weight. In its brief submitted to the Supreme Court the State of New Jersey complains that New York City officials are proceeding with plans to divert water from the upper tributaries of the Delaware to the Hudson River watershed for water power and potable purposes.

Pittsburgh Cantilever Bridge Span 545 Ft.

Information contained in the caption accompanying an illustration of East St. Bridge at Pittsburgh, Pa., appearing in *Engineering News-Record*, Jan. 9, 1930, p. 83, was erroneous in several particulars. The center span of the bridge is 545 ft., the suspended portion alone being 163 ft. 6 in. Trusses are 32 ft. 6 in. apart center to center, with a depth of 96 ft. at the piers and of 19 ft. 6 in. at the suspended span, which includes the six center panels.

WASHINGTON NOTES

By Paul Wooton
Washington Correspondent

Increased Federal Aid Voted by House—To Start Flood-Control Hearings—Field of City Power

EARLY enactment of authorizations for federal aid to highways at the increased rate of $125,000,000 annually for three years is assured by the passage of the Dowell bill in the House and by the favorable report on an identical bill by the Senate committee on post offices and post roads. The bill passed the House without the necessity of a roll call. No single voice was raised against it in the viva voce vote.

While no portion of the additional $50,000,000 can be expended before July 1, the bill provides that it may be put under contract at any time following the approval of the act. In the House 44 speeches were made in favor of the bill. Its enactment was urged principally on the grounds that highway construction affords a practical form of agricultural relief; that increased highway construction would stabilize business as a part of the President's "prudent-expansion" program, and that the federal government is not doing its part in carrying forward the highway program. In the debate it was pointed out that the states have increased highway expenditures from $397,000,000 in 1921 to $860,000,000 in 1929, while the expenditures of federal funds for highway construction have decreased from $88,000,000 annually in 1921 to $75,000,000 annually in 1929.

Public Land Transfer

By a vote of 243 to 107 the House on Jan. 24 approved the Colton bill sanctioning the creation by President Hoover of the commission on conservation and administration of the public domain. The bill, which now goes to the Senate, provides an appropriation of $50,000 for an investigation to determine the disposition to be made of the 197,000,000 acres of public land in the interest of its proper conservation. The commission will be instructed to report in December, 1930.

Creation of the commission followed a suggestion made by President Hoover last August that the public lands should be turned over to the states, as they are in a better position to handle their watershed problems than the federal government. As sub-surface rights would be reserved to the federal government under Mr. Hoover's proposal, considerable opposition to the transfer has developed in Western states. The commission's study will be directed to determining the advisability of such action. It will be composed of 25 members, 21 of whom have been appointed. Each of the eleven public land states will be represented by one member; the remainder will represent the country at large. The chairman is James R. Garfield, former Secretary of

the Interior. Passage of the Colton bill in the House followed two days of debate in which considerable criticism was voiced against the President's policy of appointing commissions to formulate policies concerning public questions of the first rank.

Hydraulic Laboratory Favored

Indorsement of the hydraulic laboratory bill by Major-Gen. Lytle Brown practically insures the passage of this measure, which has been before Congress since 1922. While the measure has found favor in the Senate from the beginning, the House committee on rivers and harbors has not been willing to override the Chief of Engineers and allow the bill to go before the House. As President Hoover has indorsed the bill in the most unqualified way and since the new Chief of Engineers regards it favorably, it is expected that the House committee will report out the measure without great delay. The bill is now on the Senate calendar with a favorable report from the commerce committee. Since the Senate passed the bill at the last session, it is expected to receive the approval of that body again as soon as it is reached.

Changes in Flood-Control Plan

Hearings before the flood-control committee of the House of Representatives for the consideration of proposed changes in the flood-control act will begin Feb. 10, Representative Reid, of Illinois, the chairman of the committee, announces. It was his original plan to await the first part of the report to be made by the Chief of Engineers before opening hearings, but as another month probably will elapse before Part I can be completed, Mr. Reid believes time will be gained by taking testimony with regard to changes in the plan which have been proposed by others. As the plan of Harry Jacobs, chief state engineer for Louisiana, is in finished form, it will be taken up first.

As a result of court rulings it is apparent that the adopted plan could not be carried out without the expenditure of an indefinite amount for property damage. There is doubt whether or not Congress will authorize the $250,000,000 or more that would be required if valuations approved for lands at Bonnet Carré and New Madrid are typical. For this reason the committee is particularly anxious to hear alternate proposals which will reduce the amount of land required. The Jacobs plan eliminates the floodway through the Boeuf basin but calls for the use of reservoirs.

Mid-West Floods

A report has been submitted to the War Department by Col. George R. Spalding, division engineer of the Upper Mississippi Division, in which it is stated that no federal intervention seems necessary in regard to the ice jams on the Wabash River at Palestine, Ill. Dynamiting of these gorges would cause more damage by the resulting rush of water than is being done by the present standing water that has been backed up, it is stated in the report. The largest ice gorge is near the vicinity of Palestine and is 8 miles long. Two additional gorges have been reported above Palestine. The Secretary of War has instructed the district engineers to maintain a close watch on the flood situation in Indiana and Illinois and to report whenever it seems likely that federal intervention may be necessary.

Society Calendar

AMERICAN CONCRETE INSTITUTE, Detroit; annual convention, New Orleans, La., Feb. 11-13.

AMERICAN RAILWAY ENGINEERING ASSOCIATION, Chicago; annual meeting, Chicago, Ill., March 11-13.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; spring meeting, Sacramento, Calif., April 23-24.

ASSOCIATION OF HIGHWAY OFFICIALS OF NORTH ATLANTIC STATES, Trenton; annual convention, Syracuse, N. Y., Feb. 19-21.

ENGINEERING INSTITUTE OF CANADA, Montreal; annual convention, Ottawa, Ont., Feb. 12-14.

CEMENT GUN CONTRACTORS ASSOCIATION will hold its annual convention Feb. 17-19 at Chicago, Ill.

COLORADO SOCIETY OF ENGINEERS held its annual meeting in Denver Jan. 18. Officers elected for the ensuing year follow: president, W. B. Freeman; vice-president, J. S. Marshall; secretary-treasurer, C. M. Lightburn.

ENGINEERS AND ARCHITECTS CLUB of Louisville, Ky., at its 39th annual meeting Jan. 21 elected George R. Armstrong president, W. M. Caye vice-president and George W. Hubby secretary.

ENGINEERS' CLUB OF SAN DIEGO, CALIF., at its recent annual meeting elected new officers for the ensuing term as follows: president, W. H. Talbott, superintendent, electric meter department, San Diego Consolidated Gas & Electric Co.; vice-president, R. D. Watts, assistant engineer, San Diego bureau of water development; treasurer, E. H. Smith, manager, American Concrete Pipe Co.; secretary, R. E. Jenson, consulting engineer.

HIGHWAY ENGINEERS ASSOCIATION OF MISSOURI will meet Feb. 18-20 at Kansas City, Mo.

IOWA ENGINEERS will gather in Council Bluffs for meetings of the Iowa section, American Society of Civil Engineers, Feb. 4, and of the Iowa Engineering Society Feb. 5-7.

MINNESOTA FEDERATION OF ARCHITECTURAL AND ENGINEERING SOCIETIES will hold its annual convention Feb. 14-15 at Duluth.

NATIONAL DRAINAGE CONGRESS will hold its nineteenth annual session at St. Louis, Mo., Feb. 19-21.

NORTH CAROLINA SOCIETY OF ENGINEERS in convention at Raleigh re-elected George F. Syme president. J. L. Beckton was chosen vice-president and Summie Whitener secretary. Wilmington was selected as the summer meeting place.

ROCKY MOUNTAIN SECTION, American Water Works Association, will hold its annual meeting Feb. 13-14 at Denver. Dana E. Kepner, Denver, is secretary.

PENNSYLVANIA ASSOCIATION OF PLANNING COMMISSIONS will hold its annual conference at Easton Feb. 18-19.

SOCIETY OF ENGINEERS, San Francisco, has elected the following officers for the year 1930-31: president, A. E. Zimmerman, Pelton Water Wheel Co.; vice-president, H. T. Sutcliffe, Pacific Gas & Electric Co.; treasurer, W. G. Rawles, East Bay Municipal Utility District, Oakland; secretary, H. D. Miller.

SOUTH CAROLINA SOCIETY OF ENGINEERS at its annual convention Jan. 9-10 at Columbia re-elected Harwood Beebe president and chose John McCrady, Charleston, vice-president and L. A. Emerson, Columbia, secretary-treasurer. The summer convention will be held in Charleston in July.

Plan Submitted for St. Francis Flood Control

In a report submitted to the House flood-control committee by the War Department for controlling the floods of the St. Francis River in Missouri and Arkansas, the recommendation is made that no portion of the cost of the project should be borne by the United States. The plan contained in the report, it is stated, would afford protection to 84 per cent of the land above the Mississippi backwater area which is now subject to overflow. The total cost of the project is placed at $17,428,000, or about $14 per acre protected. The plan presented by the district engineer provides for enlarging and extending the existing levees on the St. Francis River, the Little River, St. Francis Lake and Big Lake; for diverting floodwaters from the foot of St. Francis Lake to St. Francis Bay; for setting back certain levees to provide larger channels for the passage of floodwaters; and for enlarging the capacity of the Tyronza River by dredging. While it is reported that storage capacity can be found sufficient to regulate the greatest runoff from the hill area, it is stated that the cost of such reservoirs would not be justified, even in connection with power development.

Supreme Court to Rule on Municipal Power Field

It was held by the United States Supreme Court on Jan. 20 that a substantial federal question has been shown to exist in the case of the Yamhill Electric Co. vs. the city of McMinnville, Ore., and that the case can be properly taken up. The dispute arose over the action of the city of McMinnville in building a power plant and in sending the energy therefrom beyond the city boundaries into the territory served by the Yamhill Electric Co. In some instances it is charged the municipal plant has gone 5 miles beyond its corporate limits to serve private consumers with electric energy for profit. The power company contends that the competition of the city is contrary to the Fourteenth Amendment of the Federal Constitution, which forbids the taking of property without due process of law. Under the law of Oregon it is provided that no public utility may enter the territory served by another utility of like character without procuring a certificate of convenience and necessity from the public service commission. It is protested that the municipal company left its boundary lines and engaged in such competition without complying with the public utility laws and regulations. The Supreme Court of Oregon denied the plea of the Yamhill Electric Co. on Sept. 17, 1929.

Personal Notes

Major Layson E. Atkins, assistant engineer commissioner of the District of Columbia, has been ordered to Juneau, Alaska, where he will be engineer officer of the board of road commissioners for Alaska. He will leave Washington about the middle of May.

Walter F. Lineberger, for the past two years consulting engineer on a waterways project at Fort Lauderdale, Fla., has accepted the position of consulting engineer for the Airways Corporation of America, with headquarters in Washington, D. C.

James F. Armstrong, for the past thirteen years connected with the Arthur McMullen Co. as superintendent of pneumatic foundation work, has became associated with Senior & Palmer, Inc., engineers and contractors, of New York City, as a vice-president and director. He will have charge of similar work for that corporation.

H. W. Davies, assistant engineer and assistant secretary of the port of Seattle, has resigned to become manager and engineer of the port of Port Angeles, Wash. Mr. Davies has been associated with the port of Seattle organization for sixteen years. He succeeds W. J. Murphy, who has gone to Aberdeen, Wash., on Grays Harbor, to become manager of that port.

Ralph R. Woolley, hydraulic engineer for the U. S. Geological Survey, with headquarters at Salt Lake City, has been named a member of a board appointed by the Federal Power Commission to examine the properties of the Idaho Power Co. Mr. Woolley expects to begin the examination the early part of February.

Ernest T. Smith, Jr., formerly assistant city engineer of Gadsden, Ala., has resigned to accept a position with the Ethyl Gasoline Corporation as field representative, traveling throughout the Southeastern states, with headquarters in Atlanta, Ga.

Ross M. Riegel, designing engineer of the Pittsburgh (Pa.) department of public works, has been placed temporarily in charge of the bureau of water.

Fred K. Baker has been appointed director of public works, Olympia, Wash., to succeed John C. Denney.

W. D. Burgess has been transferred from his former position in the engineering department of the El Paso Electric Co., El Paso, Tex., to become power engineer in the industrial service department of that company.

B. M. Hall, Jr., and Warren E. Hall will continue the consulting practice of B. M. Hall & Sons, civil and mining engineers, Atlanta, Ga. This firm was established in 1889 by Benjamin M. Hall, who died Nov. 19, 1929, after more than 50 years of active engineering work. B. M. Hall, Jr., has been a member of the firm since 1916, while Warren E. Hall served as district engineer, U. S. Geological Survey, water resources branch, from 1912 to 1924, since which time he has been engaged in private engineering work in North Carolina and Georgia.

C. P. Spellman has been placed in charge of the newly organized statistical department of the El Paso Electric Co., El Paso, Tex. J. P. Shumate has been transferred from the engineering department to act as Mr. Spellman's assistant.

Obituary

Arvid Olson, contracting engineer, of Denver, Col., died Jan. 17 after a few hours' illness.

Maurice J. Lonergan, state sanitary engineer of Colorado, was stricken with a brain hemorrhage Jan. 9 and died Jan. 17. Mr. Lonergan was graduated from the University of Iowa in 1923 and for two years after his graduation was assistant superintendent of the Mason City (Iowa) water-works. He was appointed sanitary engineer of Colorado in 1929.

Erwin E. Lanpher, who for four years had been managing engineer of the bureau of water of the city of Pittsburgh, with which he had been connected for 26 years, died Jan. 18, following a heart attack. Mr. Lanpher was a graduate of Union College, Schenectady, and of Cornell University. For several years following his graduation he was connected with the water department of Atlantic City, N. J.

George B. McGrath, general manager of the George Washington Cut Stone Co., died Jan. 22 at his home in Washington, D. C. At one time Mr. McGrath was connected with the Indiana Limestone Bureau and for many years was associated with Robert G. Lassiter, of Raleigh, N. C., and managed the Raleigh Granite Co. Prior to that he was general Southern representative of the United States Asphalt Refining Co.

Henry Holgate, of Montreal, who had an international reputation as a consulting civil engineer, died suddenly Jan. 22 at his home of angina pectoris. He was 68 years old. During the earlier years of his career he was engaged in railway construction in connection with the Canadian Northern Railway. Removing to Montreal in 1894, he was engaged for some time with the Royal Electric Co. Four years later Mr. Holgate went to Jamaica as manager of the West India Electric Co., and constructed and managed the hydro-electric tramway system at Kingston, Jamaica. In 1901 he returned to Montreal and entered into partnership with Robert E. Ross and in the following ten years they constructed many hydro-electric plants, including those of the West Kootenay Power Co. and the Canadian Copper Co. In 1906 he investigated for the dominion government some matters in connection with the Trent Valley Canal, and was appointed chairman of the commission which investigated the collapse of the Quebec bridge in 1907. He became president of the Cedar Rapid Power Co. in 1911 and was later consulting engineer for the same company. He was appointed one of the board of consulting engineers reporting on the future development of Montreal harbor. Recently Mr. Holgate, in conjunction with J. A. Jamieson, conducted an exhaustive inquiry into the St. Lawrence deep waterway proposals for the Montreal Board of Trade, and concluded that the project was uneconomical and needless. He was a member of the Engineering Institute of Canada, the American Society of Civil Engineers and the Institution of Civil Engineers.

R. B. Keilliher, an engineer widely known throughout the western part of the United States and Canada, died in London recently. Mr. Kelliher came to America in the early eighties and was connected as engineer with the Union Pacific, Northern Pacific, Denver & Rio Grande and Colorado & Southern railroads in the United States and Grand Trunk Pacific in Canada. It was under his direction that the latter road was completed to Prince Rupert and Vancouver on the Pacific coast.

Philip North Moore, a mining engineer of international repute, died in St. Louis, Mo., Jan. 19, aged 80 years. He represented the American Institute of Mining Engineers in the Engineering Council from 1917 to 1919 and in its successor, American Engineering Council from 1921 to 1924, being vice-president in 1923. In 1928 he was elected to head the St. Louis Institute of Consulting Engineers.

Costs and Contracts

E. N.-R. Index Numbers

Cost		Volume	
Jan. 1, 1930	**208.96**	**December, 1929**	**166**
Dec. 1, 1929	209.46	November, 1929	245
Jan. 1, 1929	209.40	December, 1928	244
Average, 1929	207.02	Average, 1929	317
Average, 1928	206.78	Average, 1928	287
1913.....	100.00	1913.....	100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Jan. 30, with some comparisons, total as follows:

(In Thousands of Dollars)

	Jan. 30, 1930	Jan. 23, 1930	Jan. 31, 1929
Buildings:			
Industrial.....	$7,540	$7,835	$8,339
Commercial....	18,852	19,268	17,446
Streets and roads.	7,139	5,222	4,889
Other eng. constr.	15,751	16,898	21,328
Total.....	$49,282	$49,223	$52,002
Total, all classes, Jan. 1 to Jan. 30:			
1930.....			$238,002
1929.....			396,833